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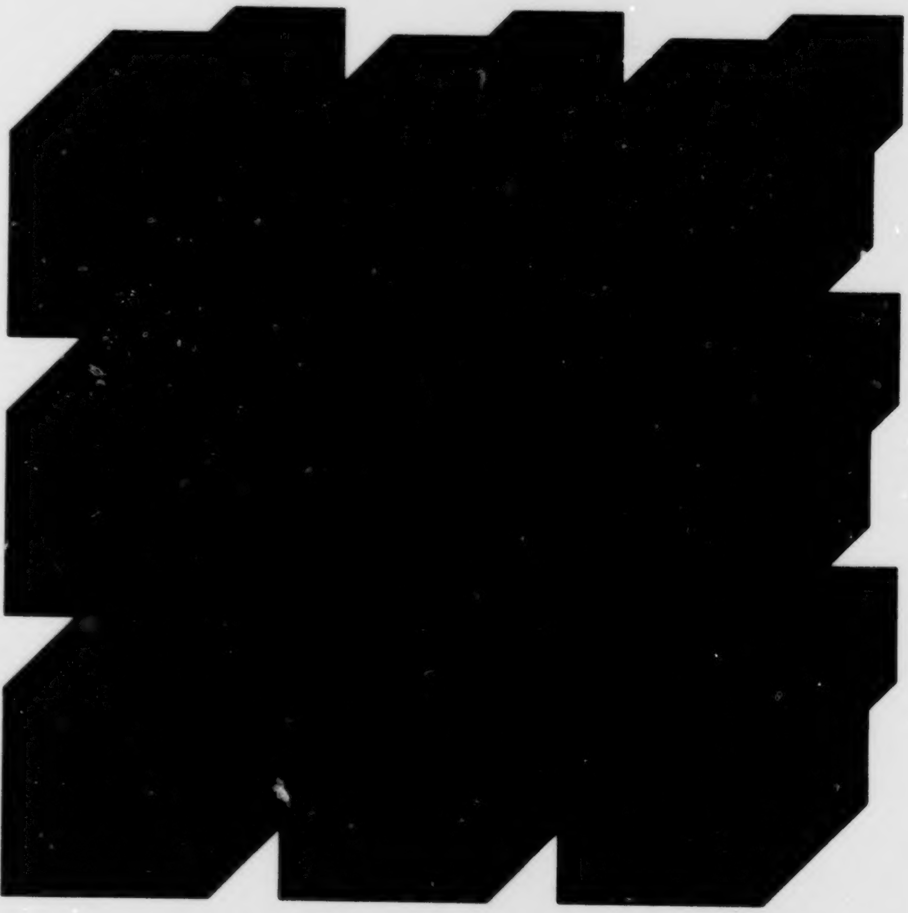

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DISCUSSION PAPER NO. 292

A Study of Issues in Government Enterprise Finance with Applications to Air Canada and Canadian National Railways

by D.H. Drury and
C.W. Sealey

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But de l'étude et présentation sommaire des résultats

Résumé

A. But

Il exite des centaines de sociétés de la Couronne disséminées dans à peu près tous les secteurs de l'économie canadienne, dans les domaines de juridiction fédérale aussi bien que provinciale. En vertu de leurs mandats, ces sociétés poursuivent une multitude d'objectifs économiques et sociaux différents et parfois même opposés. Certaines sociétés sont axées sur le développement régional, d'autres visent à soutenir le marché des matières premières et les exportations, tandis que d'autres encore touchent à peu près à tous les aspects de la vie économique canadienne. Certaines ont un mandat "public" clair, tandis que d'autres jouent un rôle plus obscur; bon nombre ont des objectifs à la fois sociaux et commerciaux. Comme le public canadien a très fortement misé sur le secteur des entreprises publiques, tant par les sommes qu'il y a investi que pour l'efficacité qu'il en attend, il est important que la performance de ces entreprises puisse être jugée et évaluée selon des critères clairement énoncés et pouvant aussi servir de base à la prise de décisions vraiment rationnelles.

Dans la présente étude, les auteurs examinent le financement des entreprises publiques. Elle est divisée en deux parties principales. La première a trait à la mise au point d'une méthodologie du processus décisionnel dans le financement des entreprises publiques. Les sujets portent généralement sur l'efficacité globale de la répartition des ressources, et plus particulièrement sur les applications aux marchés financiers. Les auteurs considèrent que le premier élément de discussion sur les finances des entreprises publiques consiste à déterminer si la prise des décisions financières doit être traitée de façon différente de celle de sociétés privées.

Pour formuler des réponses à ces questions, il faut nécessairment formuler des hypothèses. La première et la plus importante est - présume-t-on - que les opérations des sociétés publiques doivent être fondées exclusivement sur des critères d'efficacité économique. Quel que soit leur fonction dans le domaine de la politique publique, il faut présumer que cette tâche sera exécutée avec une plus grande efficacité. Pour ces organismes, il nous faut ignorer le rôle de redistribution, s'il existe, car il n'est pas du

ressort de l'analyse positive de déterminer quel doit être le degré optimal de redistribution en vue d'un équilibre efficient quelconque. Les jugements de valeur de cet ordre relèvent nécessairement du domaine politique et ne peuvent donc entrer dans l'analyse économique et financière.

La seconde partie de l'étude présente des vues plus spécifiques; elle traite de la mise en oeuvre des conclusions méthodologiques de la première partie et de leur application à la prise des décisions financières de l'entreprise publique; ainsi exposons-nous les particularités de la méthodologie et présentons-nous son application au moyen de quelques exemples. La démonstration est faite à partir de deux exemples particuliers d'entreprises publiques: Air Canada et la Canadien National. Bien que les données soient utilisées pour deux exemples connus, rappelons que le but de cette partie de l'étude n'est pas de rendre un jugement sur les décisions réellement prises par ces sociétés, ni dans le temps présent ni dans le passé, mais plutôt de démontrer l'utilité et le côté pratique de la méthodologie elle-même. Pour appliquer cette dernière, il faut dans bien des cas qu'une nouvelle relation soit établie entre le gouvernement et ses sociétés de la Couronne, étant donné que les impératifs de l'efficacité économique contraignent le gouvernement à adopter un rôle d'actionnaire plutôt que de bienfaiteur. En dernier lieu, les auteurs se penchent sur la question de la désétatisation.

B. Présentation sommaire des résultats

Plusieurs constatations et recommandations se dégagent de l'analyse présentée dans cette étude. On peut les résumer ainsi:

1. L'efficience économique, au sens de la répartition des ressources, exige que l'on considère les prix du marché comme des indications précises du coût d'option social, sauf dans les cas où le marché ait défaut suite à une défaillance du modèle concurrentiel. Même s'il est évident qu'il y a effectivement défaillance du marché, il est nécessaire d'évaluer le degré d'erreur dans l'allocation des ressources, pour s'assurer que le coût de la correction à apporter ne dépasse pas celui qui a résulté de l'erreur.

2. Comme il n'existe aucun cas important de défaillance du marché canadien des capitaux, les critères qu'utilisent les entreprises publiques pour fonder leurs décisions financières, tant en ce qui concerne l'obtention d'investisements que la structure du

capital, devraient être les mêmes, si possible, que ceux des sociétés privées.

3. Étant donné, toutefois, qu'il existe quelques indices d'une défaillance du marché canadien des capitaux, le coût d'option social du capital en cause dans les décisions d'investir est identique à celui du capital déterminé sur les marchés financiers pour des projets dont la rentabilité et les risques sont semblables. Ainsi, les arrangements que font les entreprises publiques pour financer leurs activités devraient être considérés par le gouvernement comme ceux d'une société "autonome".

4. Si une entreprise gouvernementale reçoit un mandat d'intérêt public, par exemple si elle doit corriger une certaine inefficacité du marché, comme une externalité, ou réaliser certains objectifs politiques de redistribution, la subvention devant lui permettre d'éliminer cette inefficacité - si elle est nécessaire - devrait lui parvenir par le biais du marché concerné. Les subventions destinées aux marchés financiers ne devraient pas servir à corriger des inefficacités dans un autre domaine, étant donné qu'un tel financement compensatoire produit un effet nocif sur les prix relatifs dans chacun des secteurs, tout en risquant d'ailleurs d'entraîner des inefficacités dans les deux secteurs.

5. Pour assurer l'efficience économique, le critère objectif des décisions d'une entreprise publique doit être de maximiser sa valeur propre. Celle-ci doit être mesurée d'après les conditions du marché et, comme les actions des entreprises publiques ne sont pas négociables, les décisions doivent tendre à maximiser la valeur de la société de la même façon que si elles l'étaient effectivement.

6. Un tel processus décisionnel nécessite le recours à une méthode permettant d'estimer la valeur marchande des entreprises publiques comme si leurs actions étaient en vente libre. Il est possible d'utiliser les données comptables publiées pour en estimer la valeur marchande.

GOVERNMENT ENTERPRISE FINANCE

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GOVERNMENT ENTERPRISE FINANCE

CHAPTER I

PURPOSE OF THE STUDY AND SUMMARY OF RESULTS

I. PURPOSE OF THE STUDY AND SUMMARY OF RESULTS

A. Purpose

Public enterprise has become pervasive in the Canadian economy. There are literally hundreds of Crown Corporations under federal and provincial jurisdiction. These corporations are charged with hundreds of different, sometimes conflicting, economic and social objectives. Some are aimed at regional development, others at resource markets and export trade, while others deal with virtually every aspect of Canadian economic life. Some have a clear "public" mandate while others play a more obscure role in society. Many of these enterprises have both social and commercial goals. Since the Canadian public has such a large stake in the public enterprise sector, from both an investment and efficiency view point, it is important that these firms have clear criteria against which to judge and assess performance on the bases of which rational business decisions can be formulated.

In the present study, the financing of public enterprise is examined. The study is divided into two major parts. The first part deals with the development of a methodology for financial decision-making of public enterprise. The issues deal with efficiency in the allocation of society's resources in general with applications to financial markets in particular. The authors believe that the first key element in a discussion of public enterprise finance is to determine whether financial decision-making of public enterprises should be treated differently than those of any privately owned corporation.

To formulate answers to these questions, certain assumptions must necessarily be made. First and foremost, it is assumed that the actions of public corporations should be based on economic efficiency criteria alone. Whatever the public policy role of a crown corporation, that role is assumed to be furthered by greater efficiency. The redistributive role of these firms, if any, is ignored, the reason being that positive analysis can say nothing about the relative desirability of any number of allocatively efficient equilibria. Such value judgements are necessarily in the political domain and thus beyond economic and financial analysis.

The second part of the study involves specific development and implementation of the methodological conclusions of part one to financial decision-making of public enterprise, i.e., the specifics of the methodology is presented and its implementation demonstrated. The demonstration is applied to data for two specific examples of public enterprise: Air Canada and Canadian National. Even though data for two actual examples are used, it should be kept in mind that the purpose of this part of the study is not to pass judgement on the actual decisions of these corporations, either past or present, but rather to demonstrate the usefulness and practicality of the methodology itself. The methodology, if implemented, would require, in many cases, a new relationship between government and its crown corporations since economic efficiency requires government to behave more in the role of a shareholder rather than a benevolent benefactor. Finally, the issue of privatization is addressed.

B. Summary of Results

There are several results and recommendations that are derived from the analysis presented in this study. They can be summarized as follows:

1. Economic efficiency, in an allocative sense, requires

that market prices be used as accurate signals of social opportunity cost except in cases where markets fail from a breakdown in the competitive model. Even when market failure is clearly present, it is necessary to assess the degree of misallocation to ensure that the cost of correction is not greater than the cost of the misallocation.

2. Since there is no significant degree of market failure in Canadian capital markets, the criteria used by public enterprise to judge the desirability of financial decisions, both investment acquisitions and capital structure, should be the same as corporations operating in the private sector whenever possible.

3. Since there are a few signs of market failure in Canadian capital markets, the social opportunity cost of capital to be applied to investment decisions is identical to the cost of capital determined in financial markets for projects of similar profitability and risk. Thus, the financing arrangements of public enterprise should be treated by the government "at arms length".

4. If public enterprise is charged with public policy mandate, e.g., to correct some inefficiency in the market such as an externality or to achieve political restributiongoals, the subsidy to correct the inefficiency, if one is necessary, should be paid through the market where the inefficiency is present. Financial markets subsidies should not be used to correct for inefficiency elsewhere since such cross subsidizations adversely effect relative prices in both markets leading to possible inefficiencies in both.

5. Economic efficiency requires that the objective criterion for decision-making of the public corporation be to maximize the value of corporation. Value should be measured in market terms and, since the shares of public firms do not trade, decisions should be made that would maximize value as if, indeed, the shares did trade.

6. Such a decision-making methodology requires a method of estimating what the market value of public firms would be if they were publicly traded. It is possible to use published accounting data to estimate market value.

PART I

METHODOLOGICAL ISSUES IN GOVERNMENT ENTERPRISE FINANCE

CHAPTER II

EFFICIENT ALLOCATION IN A COMPETITIVE ECONOMY

PART I: METHODOLOGICAL ISSUES IN PUBLIC ENTERPRISE FINANCE

II. EFFICIENT ALLOCATION IN A COMPETITIVE ECONOMY

A. The Allocation Problem

The fundamental economic problem of any society is the problem of resource limitations or scarcity. The resources of land, labor and capital that are used to produce the vast array of goods and services consumed in an industrialized society are available in both limited quantity and quality. Human wants, on the other hand, are generally characterized as being of unlimited scope, at least when compared to the availability of resources. The conflict between desires to consume and the ability to produce leads to the fundamental preoccupation in the study of economics, viz., the study of allocation. Since all wants and desires cannot be satisfied, resources must be channeled (allocated) into productive endeavors that will satisfy only part of these wants. Thus, some wants are satisfied while others must remain unsatisfied.

B. The Definition of Optimal Allocation

In a large and atomistic economy such as the Canadian economy, the allocation and distribution of the vast number of resources, finished goods, services, etc., is orchestrated not by a centralized planning authority but rather by a myriad of signals known as prices. For a private enterprise economy, prices are determined by the complex interaction of thousands of buyers and sellers acting through markets. Prices are established by competing buyers and sellers attempting to optimize their economic well being.

The ultimate goal of financial markets, as with any market, is to allocate resources to maximize the welfare of society. Although this is a laudable goal, the concept of social welfare itself is vague and the conditions necessary to further this goal are difficult, or perhaps impossible, to operationalize. The problem arises when one attempts to make the transition from individual welfare to the welfare of society as a whole. The most crucial difficulty is the choice of an acceptable criterion for the comparison and ordering of different social states. The difficulty in making these choices stems from the fact that many choices will make some individuals better off while making others worse off. Since economists, or any other professional field for that matter, have not been able to develop any methods to dependably compare welfare gains with welfare losses across individuals, there is no way of combining the utility levels of individuals into an index that will order social states according to the level of social welfare. Hence, when movement from one social state to another makes some individuals better off at the expense of others, there is no objective way of evaluating those states in terms of overall social welfare. Movement from one such state to another involves political decisions that can only be judged by the political system. They cannot be judged on objective economic grounds.

As a result of the complexities and ambiguities of evaluating social states in terms of social welfare, economists have chosen to evaluate the efficiency of an economic system, and have judged alternative policies, on the basis of a more restrictive notion of optimality. This notion of optimality is known as Pareto optimality. A given state of the economy is said to be Pareto optimal if, when compared with others states, no other state can make an individual(s) better off without making another individual(s) worse off. Clearly a move that improves the welfare of some at the expense of others cannot be judged good or bad without making a subjective judgment about the relative utility gains versus losses. Obviously, such subjective judgments fall into the realm politics rather than economics. Since an extensive analysis of the political implications, and political desirability, of policy alternatives is beyond the scope of the present study, the notion of optimality in markets that is adopted here is Pareto optimality.

C. Conditions for Optimal Allocation

The next issue is what type of economic organization will lead to a Pareto optimal allocation of resources? One of the basic tenets of microeconomics is that a competitive market economy will automatically reach an equilibrium such that scarce resources are allocated efficiently in the Pareto sense. Before discussing actual allocation properties of financial markets, it is useful to discuss in general terms the conditions necessary for competitive markets and thus Pareto efficient allocation.

The first and perhaps the most important of the competitive assumptions is that economic agents make decisions in such a way as to maximize profit or satisfaction without regard to the effects of these decisions on prices. It is important to note that competitive behavior as defined here is a matter of attitude and does not necessarily depend on sheer numbers. Competition is frequently defined in terms of the number of buyers and sellers, implying that when there are many buyers and sellers that markets are necessarily competitive, and that were there either few buyers or few sellers, that market would necessarily be less competitive. While competitive behavior is more likely to occur the greater the number of market participants, it is possible to have large numbers of buyers and sellers acting more or less independently without producing the competitive result. For example, if buyers and/or sellers consider the likely influence of their actions on the actions of other agents and upon market prices, it is possible for the market determined price to deviate from the competitive price necessary for efficient allocation. Even if by some fortuitous circumstances prices happened to be the same as that resulting from competition, the quantities traded in the market might deviate from the competitive amount. On the other hand, even if there are only a few buyers or sellers in the market, or even possibly a single buyer or seller, if each should choose for some reason to act as if the market price were unaffected by their action then the necessary condition is satisfied.

It is also important to note that the competitive definition does not allow competitors to have a pricing policy. If a supplier sets a price on the product or a buyer announces a price at which purchases will be made, the commodity's price cannot be assumed to be determined by impersonal market forces.

Perfect competition is often defined as a situation where any one seller faces a perfectly elastic demand curve. Thus, all of the market demand will be supplied by the seller or sellers with the lowest price. Sellers with prices only slightly higher will get no business at all. This description, however, is not adequate to give a deterministic solution to the output decision of competitive sellers since it gives no way of dividing total output among the various sellers. The division of output can be determined only by some arbitrary rule, or if producers have an output policy, as is generally the case, they can concentrate on the output policy and consider the price as being determined entirely through the market mechanism. This mechanism is thought of as being impersonal and automatic and not determined by buyers and sellers individually. In fact, in a perfectly competitive market no seller can set a price higher than competitors without losing all sales. Neither can a lower price be set without being swamped with business. The ability of all economic agents to determine prices is completely circumscribed. Thus, competitive behavior is considered to be behavior that accepts market prices as externally determined, with market participants deciding on the amount to be bought and sold. Any price setting behavior by a buyer or seller thus becomes by definition an indication of some degree of imperfect competition.

Although administered prices are common in many markets of a modern economic society, and thus the extreme degree of competitive behavior described above is not applicable to all markets (in fact it may be applicable to only a minority of markets), this does not necessarily mean that an analysis based on competitive assumptions is completely inapplicable. There are many cases in which it can be taken as a first-approximation of actual market behavior even if competition is of a less perfect variety. It does, however, suggest that in applying the model one should take care to account for any significant deviations from the competitive assumptions.

The second assumption associated with the competitive model is that prices adjust so that markets constantly clear. In other words, prices adjust so that market demand and market supply are equal and there is no unsatisfied demand or supply. If demand exceeds supply, the market price must increase until demand is rationed off and supply stimulated to the extent that they are equalized. On the other hand, if supply exceeds demand, prices must fall.

A competitive equilibrium also requires that firms operate under conditions of decreasing returns to scale and thus increasing costs. In competitive markets, since demand is perfectly elastic to each supplier, conditions of decreasing returns are necessary to limit the size of firms. Otherwise, firms may grow so large relative to the industry that the result is such a small number of firms that competitive behavior may be precluded. In the extreme case, however, even if firms grow to such a large size that they can exercise an appreciable influence on prices in the markets in which they operate, it may still be possible to obtain competitive results if firms fail to take advantage of their ability to influence prices. Because of such factors as antitrust threats, public opinion, or direct government control.

Perfect competition and increasing returns to scale, however, are mutually incompatible. If average cost is declining, marginal cost will be less than average cost. If an entrepreneur acts as though the price of the product is given, then either the price is higher than marginal cost, in which case the competitive firm could increase profits (or diminish losses) by expanding output, or if price is not above marginal cost it will then be below average cost, and the firm will lose money. No equilibrium of the usual type is possible, and any firm that ignores its influence on prices will go bankrupt. If an economy contains such increasing-returns industries, a Pareto optimal allocation requires something other than profit motivated market behavior. In this case, optimal allocation requires the firm to produce output such that the market price is equal to marginal cost, which in turn results in a loss to the firm and will have to be subsidized from outside sources.

The third main assumption on which optimal allocation depends is that each economic agent affects other agents only through its buying and selling actions in the markets for the various resources, goods, and services. Any external effect that is transmitted in any way other than through the market is assumed to be absent. In other words, each economic agent is regarded as an isolated entity that has contact with other agents only through the market.

As would be expected, in the real world economic agents affect the welfare of other in ways other than through their interactions in buying and selling commodities in markets. These effects have been termed neighborhood effects, externalities, etc. To avoid confusion, these effects will henceforth be referred to in this study as externalities. The important aspect of such externalities is that they refer to effects that are "external" to the market. Externalities can be categorized into uncompensated costs imposed on others and/or unpaid benefits conferred upon others. In either case, the costs and/or benefits normally come without the specific consent or expressed desire of the affected parties, and ordinarily without any specific compensation.

These externalities can be classified as either external economies or diseconomies of either consumption or production. Thus an increase in medical care obtained by one family may improve the health of neighbors and could be an example of an "external economy of consumption". Since driving on a congested highway increases the congestion experienced by others, it would be termed an "external diseconomy of consumption" in the case of the pleasure trip, but an "external diseconomy of production" where the congestion is caused by trucks or people driving to work. In the classical example of external economies in production, the pumping out of one mine lowers the water level in nearby mines and thus lowers their costs of pumping; a corresponding external diseconomy in production may be illustrated by the competitive drilling and pumping in an oil pool, and consequent reduction in oil to the general pool, or when the productive activity on the part of one producer makes production more difficult for others.

Unfortunately, the terms "external economies" and "external diseconomies" are often applied to effects that are felt entirely through the market, and it is normally more important to distinguish these cases than it is to draw a sometimes difficult line between economies and/or diseconomies of consumption and of production. Thus, if a given industry uses a large part of the total supply of a certain factor, the fact that expansion of that industry will raise the price of that factor is sometimes referred to as an external diseconomy. This kind of "external diseconomy", since it is completely transmitted through the market in no way invalidates the optimality of the competitive model. Other examples of external effects abound and, likewise, many if not all are transmitted entirely by the price mechanism.

On the other hand, external economies of scale arising entirely through the market do not fit well into a competitive framework. One of the only important cases where such economies arise and expansion of an industry lowers the price of a factor is where the factor is supplied by an industry characterized by internal economies of scale. Expansion of an industry in a given locality may, for example, increase traffic on a railroad serving the community so that each individual firm is able to secure lower freight rates, because of the decreasing-cost character of the railroad's operation. In this case, while the railroad cannot be operated as a multi-firm competitive industry, there is no incompatibility between the attainment of a Pareto optimum and a competitive regime in the industry enjoying the external economies. The problem of securing an optimum allocation of resources lies wholely in dealing with the internal economies of scale of the railroad, and if this is dealt with adequately, the market mechanism itself can be relied upon to produce the proper effect on the railroad industry as well.

Finally, the fourth assumption necessary to the optimality of the competitive model is that consumers are to be considered the court of final recourse as to the relative satisfactions that they derive from different situations, and that they are capable of predicting accurately the satisfaction which they will derive from the consumption of various possible combinations of goods and services.

Given that the assumption of consumer sovereignty is accepted, the assumption is crucially dependent on the ability of the consumer to accurately predict the satisfaction they will derive from various consumption baskets. The assumption of adequate consumer information is many times contradicted by the actual behavior of consumers. Most types of advertising, for example, are based on the assumption that consumers are, at least to some degree, uncertain about the satisfaction that they will obtain from alternative patterns of expenditure. Moreover, consumers often behave in a manner that suggest their preference orderings change through time not only by reason of changing age and other external factors, but as a result of changes in underlying information and attitudes. Since it cannot always be assumed that the later set of tastes is necessarily based on more accurate or complete information, there is a problem of deciding whether to compare the desirability of two situations on the basis of the earlier or the later tastes. Where such changes in tastes take place, there is no method of determining *a priori* which of the two scales of preference should be taken as the final criterion, or whether some unspecified aggregation of the two (or perhaps more) scales is needed. Whatever decision is reached on this point will normally be reached on grounds other than economic analysis.

Closely related to the assumption of knowledge on the part of the consumer about the consequences of various consumption patterns is the assumption that firms have complete knowledge of the production process in which the firm is engaged, and also must know the market prices of all the factors and products involved. It is necessary, furthermore, to assume that adequate consideration is given to the possibility of making use of all possible productive processes, i.e., that for every productive process that is potentially economical, there is at least one firm who knows the corresponding production function. Moreover, for each process actually in use there must be a sufficient number who know its production function to permit the competitive conditions to be realized.

Again, as with the previous assumptions, the amount of information that is, in principle, necessary for the strict optimality of the competitive model is substantially greater and more exact than one is likely to find in the real world. Ironically, it is just this assumption on which a competitive economic system rests its claim to being superior to most other systems in the degree to which the ideal will be approached in practice. Certainly an omniscient central economic planning authority, given the knowledge of all of the information available to each consumer and firm could, in principle at least, produce a plan that would achieve the Pareto optimal allocation, and presumably could do this on the basis of any desired pattern of distribution of incomes. But information on this scale cannot be obtained by any individual or committee of individuals, nor stored within any computer memory. Even if it could be done, the sheer cost of transmitting the information to the central agency and distributing its directives would be prohibitive. A competitive economic system decentralizes decision-making and permits decisions that affect only a specific area directly to be made by those who are particularly familiar with that area, integrating those independently made decisions into a functioning economic system through the mechanism of the market. Only in a competitive economic system can this decentralization be carried through to the optimum extent.

In summary, the conditions required for the optimality of competition are in fact violated to a greater or lesser degree in a large variety of ways, and the competitive model can serve as only an approximation of the actual economic world. Nevertheless, the model serves as a useful framework within which to consider the operation of an economic system in more detail, and in fact is an almost indispensable model without which it would be difficult to reduce the complexities of the modern economic world to any semblance of systematic order. If this overall model is suitably modified at the points where immediate attention is being concentrated, it may serve as the basis for a series of workable approximations to particular markets , even though if one were to attempt to consider simultaneously all of the various modifications indicated by substantial differences between the model and the real world the model would become so complex as to be completely useless.

CHAPTER III

OPTIMAL ALLOCATION AND EFFICIENCY IN FINANCIAL MARKETS

III. OPTIMAL ALLOCATION AND EFFICIENCY IN FINANCIAL MARKETS

A. The Role of Financial Markets

The basic problem of resource scarcity is no less present in financial markets than in the markets for real goods and services. In fact, scarcity in financial markets is the direct consequence of resource scarcity described in the last chapter. To see this, it is necessary to look at the characteristics of financial market activity and their relationship to the markets for real goods and services. Fundamentally, financial markets perform the function of transfering current purchasing power from lenders to borrowers with a simultaneous agreement to reverse this transfer in the future. The driving force in the operation of financial markets is the transfer of funds from those members of society that save to those that borrow (dissave). In economic terms, saving is that part of current production that is not consumed in the present time period. In other words, it is that part of current production that is not composed of consumable goods but is rather investment goods. Thus, saving frees scarce resources from the production of consumer goods so that those resources can be devoted to the production of capital goods. Since resources are limited in the production of real goods and services, real financial resources (funds that are a real claim against that production) are also scarce. Hence, because real resources must be allocated to alternative employments, likewise financial resources must also be allocated among competing uses. The basic function of financial markets is to facilitate this allocation process.

B. Participants in Financial Markets

For financial markets, the allocation function is carried out through a varied array of institutions, brokers and exchanges. In these markets, financial assets are brought and sold and the prices of assets are determined. On a simple level, the participants in financial markets can be divided into two principal groups. First, there are investors (savers) who purchase financial assets. Unlike the purchase of goods, financial assets are not directly consumable but rather offer the saver an opportunity to defer consumption by offering a future stream of income that allows consumption is the future. Savers may be either individuals or corporations, and on rare occasions, even governmental units. Second, there are users of financial capital who issue securities that represent liabilities to the issuing agent. These uses of financial capital can conveniently be divided into three types: firms individuals, and governments. Businesses borrow primarily to invest in economic capital whereas individuals and governmental units borrow largely for consumption purposes.

It is also important to note that financial markets can be thought of as being composed of two such markets: money markets and capital markets. These two markets are distinguished largely by the maturity of the investments traded there. In money markets, short-term funds are exchanged. These funds are used to purchase consumables by individuals and, for businesses, these funds are used to finance short-term assets such as accounts receivable and inventories. Capital markets, on the other hand, are markets for long-term funds of which stock and bond markets are prime examples. It is the capital market that supplies funds for fixed business investments and will be of principle interest in the present study.

C. Efficiency and Optimality in Financial Markets

The existence of financial markets allows economic agents with surplus funds to allocate those funds to economic agents with an excess of productive opportunities but deficient financial resources. Firms presumably have investment opportunities that are superior to those available to savers so that financial transactions increase the welfare of both borrowers and lenders.

This allocation process in financial markets has two primary objectives. First is the goal of transfering current purchasing power from savers to investors. As mentioned above, the economic definition of saving refers to the process of not consuming in the current time period. This purchasing power is transfered to businesses to be repaid from the future returns on productive investments. Second, since the future returns on investment projects is uncertain, a principal objective of financial markets is to allow investors to share, or spread, risk among a large number of individuals.

The mechanism by which an efficient allocation of resources is reached in the atomistic free market system, and the signals that coordinate these atomatic markets, are prices. In financial markets, no less than in commodity markets, the price mechanism plays a crucial role. Funds are priced so that businesses and individuals can make rational allocations of investable funds. The return on investment is used as an important piece of information by both savers and producers since this rate ultimately determines which investment projects are undertaken and which are abandoned. If financial markets are efficient in their allocation process, then scarce savings will be optimally allocated to projects so as to achieve Pareto optimality.

As discussed above, efficient allocation of resources, both real and financial, can be objectively defined in terms of Pareto optimality. In some sense, this means that resources are allocated to those productive purposes that society most highly values. The value of employment of resources is reflected through the price mechanism. Of crucial importance to the present study is the degree to which financial market allocations result in Pareto efficiency.

Fortunately, the conditions for general optimality discussed in the previous chapter, i.e., competitive markets, are also sufficient to give optimality in financial allocations. Although perfect competition will result in efficient allocation in financial markets, the emphasis is somewhat different when dealing with financial allocation. The complicating factor is uncertainty. In real resource markets, the issues of uncertainty and risk are often justifiably ignored since the elapsed time from the employment of resources to the sale of the final product is usually relatively short. Thus, the return on operating funds devoted to production is normally assumed to be known with some degree of certainty. The only information that is generally considered to be crucial, as discussed earlier, is the information the firm has about the technological aspects of production, prices of products being produced and factor prices. Although these aspects of firm activities may be uncertain, the degree of uncertainty is limited in most cases.

The return to capital investments, however, cannot reasonably be assumed to be known in advance since the return stream generated by the investment will normally be realized over many years in the future. Thus, the return on a particular investment must be judged on the basis of both the expected return and the uncertainty or risk of that return.

Since uncertainty plays a crucial role, current market valuation must be based on the efficient use of all information that impacts on future investment returns. Efficient allocation of financial capital requires not only that securities be bought and sold in a highly competitive environment, but that relevant information about likely risks and expected returns be used efficietly. Thus, information availability and use is much more critical in financial market analysis and plays a critical role in allocational efficiency.

Financial markets are said to be efficient if, in addition to competitive market behavior, security prices fully reflect all information currently available about future returns and risks on those securities. In efficient markets, prices reflect the market's best estimate of the economic worth of an investment so that the prices of individual securities or assets reflect their "real" value since market prices adjust quickly to new information. Pareto optimality is achieved when investments are undertaken up to the point where the expected marginal social return on those investments is equal to the expected risk-adjusted marginal social cost of capital. Since informational efficiency requires that prices (rates of return) in the market reflect all available relevant information about future returns, in the absence of externalities prices are accurate signals of the worth social of various investment alternatives. When markets are efficient in the above sense, capital resources are allocated to maximize welfare in the Pareto sense.

CHAPTER IV

MARKET FAILURE AND INTERVENTION

IV. MARKET FAILURE AND INTERVENTION

A. The Rationale for Government Intervention

Government intervention in the Canadian economy, both federal and provincial governments, is wide spread and examples are too numerous to mention. In general, however, there are two types of intervention that are relevant to the present study. First, governments intervene by regulating the activities and setting the prices of goods and services that are produced by privately owned firms. Such intervention is widespread resulting in the setting of prices in a wide range of industries. Second, governments may intervene directly to obtain public ownership of a given firm or even industry. The resulting public enterprise may either be regulated as would otherwise privately owned businesses, and even compete with such businesses, or may operate in a relatively unregulated manner.

As pointed out in Chapter II, competitive markets automatically achieve a Pareto optimal allocation of society's resources. On economic grounds, government intervention in the economy, either through regulation and/or public ownership, can be justified only if the market mechanism fails to allocate society's scarce resources efficiently. In other words, intervention may improve efficiency if the competitive model fails. As alluded to earlier, the conditions for Pareto efficient allocation are quite specific, requiring perfectly competitive markets. Obviously, the assumptions necessary for the competitive model are somewhat heroic. It is equally true, however, that many of the assumptions serve as a good first-approximation of economic reality in a number of markets. Thus, market failure is usually a matter of degree and varies widely from industry to industry and market to market. Moreover, intervention by government to correct market shortcomings is always costly and, since the loss of efficiency in many markets is arguably quite small, it is likely that in many cases the cost of intervention will be greater than the cost of the original inefficiency. Thus, a rational policy of government intervention necessarily requires a careful assessment of the potential costs and benefits of intervention.

B. Types and Causes of Market Failure

Although there are a plethora of arguments put forth to justify government intervention, two broad classifications of arguments arediscernable:

- Government intervention is justified to improve economic efficiency by eliminating (at least partially) losses in efficiency caused by market failure;
- Intervention is also justified to correct perceived inequities in the distribution of income.

Using the terminology introduced in Chapter II, the first justification involves using government intervention to move the economy towards Pareto optimality while the second justification involves the selection of one Pareto optimal allocation over another. Since the latter rationale for intervention requires improving the welfare of some while reducing it for others, there is no positive economic analysis that can be applied to justify these policies. Instead, political value judgements must be made that are outside the realm of economic analysis. In this study, the former justification will be analyzed as the rational basis for government intervention in general, and eventually, financial market intervention in particular.

There are as many reasons for market failure as there are necessary assumptions for the competitive model. First, there are frequent breakdowns in the assumption of competitive behavior. In many markets, there are insufficient numbers of firms to result in price-taking behavior. A major cause of small numbers is the technical nature of the production process in certain industries. The classical example of this market failure is the public utility industry. Because of the enormous fixed investment involved in production and the cost of duplicating distribution facilities, the industry is normally characterized by increasing returns-to-scale over a large part of the long-run production function. This situation normally leads to a small numbers of producers, or frequently only one producer. To prevent the single (or small number of) producer(s) from exploiting its (their) monopoly position and to correct the resulting inefficiencies, governments intervene to set prices at levels that more closely approximate the competitive level. This may either be done by regulation alone or through public ownership in conjunction with regulatory price setting.

A second, and more important source of market failure, is the existence of nonmarketable externalities in production and/or consumption. These externalities generally arise from the existence of public goods. Conceivably, all economic activity could be carried out efficiently by the private market system, except perhaps for the minimal governmental functions of providing law and order to prevent anarchy in society. Why, then, is there considerably government intervention in all advanced industrial (as well as less developed) economic systems? A large part of the answer lies in the existence of externalities arising from public goods and public consumption. When any economic system engages in production, scarce resources are used at a cost, and benefits are created in the form of consumption. If the resources employed and goods produced are strictly marketable, i.e., the activities of producers and consumers are linked only through the price system, then the cost of production and the benefits of consumption are internalized to those directly and voluntarily involved. In this case, the private costs and benefits of economic activity are said to coincide with the public costs and benefits of this activity so that competitive markets will result in Pareto efficiency.

Market failure results when there is a divergence between public costs and benefits and the corresponding private costs and benefits. Such a divergence will occur when the resources employed in production and the goods produced cannot be subjected to the "exclusion principal." For example, when there are resources used in production that are employed without proper payment to the supplier, then public costs and private costs may diverge. Likewise, when those who benefit from consumption are not required by market forces to pay for the consumption, then there may be a divergence between public benefits and private benefits.

The existence of these differences in public costs and/or benefits and their private counterparts is a more rigorous way of defining externalities in production and/or consumption. These externalities may either be positive or negative in both production and consumption. It is the very existence of public goods that causes externalities to arise. Thus, the divergence of private and social costs and/or private and social benefits results in market failure since the market is capable only of assessing (pricing) private benefits and costs. Government intervention may be justified in the name of increasing economic efficiency by internalizing the externality.

The classic example of a non-marketable externality in production is the case of air and water pollution. In the absence of government intervention, a firm may use the air or water to dispose of industrial wastes without cost to the firm or the consumers of the products produced. In effect, the firm is using the scarce resources air and water but does not pay for their use. If no costs are incurred by other individuals in society as a result of this use, then there are no inefficiencies created. Other economic agents, however, may bear considerable costs without appropriate compensation. For example, the health of individuals who breath the air or drink the water may suffer as well as business activities such as tourism, fishing and water sports, to name only a few.

Why does the firm not pay for these economic costs? The answer lies in the fact that air and water are resources are public goods. The exclusion principal cannot be applied and thus the market cannot appropriately price. Those who pay the price of pollution cannot individually withhold the resource until appropriate compensation is made.

The effect on resource allocation is that the scarce resources of air and water are not properly allocated. Since they are free to the polluting firm, the firm may use them indiscriminately without consideration of the cost to society. Thus, air and water are overused while capital investment to control pollution is underutilized. The answer to this allocation problem is collective (government) action to correct the misallocation.

Another relevant example of market failure is the case of positive externalities in consumption. In this instance, the firm is likely to produce less of a good than is socially optimal since public benefits are greater than private benefits. For example, the provision of transportation services to a particular geographical area may benefit people other than those that actually use the transportation. The existence of the transportation may increase economic development and tourism, for example. If the travelling public is forced to pay the full private cost of providing the service, then the service may be underutilized, or perhaps will not be provided at all. Collective action on the part of the community may lead to better economic allocation by providing a subsidy to transportation to increase utilization and equate private and social benefits.

The above discussion of returns-to-scale, public goods, and externalities is based on cases where only a portion of the allocative process fails. In these cases, government regulations that apply to the specific externality (e.g., pollution controls) can be quite effective while the firms involved remain under private control. There is another aspect of the same problem that may be more relevant to public enterprise. This is the issue of social balance. Social balance refers to an intersector resource misallocation in the form of underallocation of resources to the public sector and corresponding over allocation to the private sector. Because of market failure, public goods cannot be produced and sold in a completely private market system, at least at prices that will cover cost. Since the exclusion principal cannot be used to isolate those who consume and benefit from public goods, they cannot be charged accordingly and there are serious problems with "free riders" (i.e., those who consume but do not pay). Thus, there is a positive externality in consumption in that individuals benefit from consumption without paying the cost of production.

The solution to the social imbalance question is government intervention to correct the imbalance. This intervention can take two forms. One, the government could provide direct subsidies to private producers of the public goods. Second, the government could use public enterprise to produce and then subsidize the enterprise either directly or indirectly. In either case, however, subsidies are necessary to correct such an imbalance.

CHAPTER V

FINANCIAL MARKETS AND GOVERNMENT INTERVENTION

V. FINANCIAL MARKETS AND GOVERNMENT INTERVENTION

A. Means and Objectives of Financial Market Intervention

The previous chapter outlines in brief form the reasons most often cited to justify government intervention into private sector allocations. The discussion there was couched in general terms without specific reference to any particular market. In this section, the discussion is extended specifically to financial markets. Before dealing explicitly with market failure, however, it is useful to distinguish between what is sometimes called " credit markets" and "capital markets". The term "credit markets" was used to designate those markets where largely short-term financial contracts are exchanged. The institutions that are involved are mainly chartered banks, trust companies and, for business purposes, they generally (but not always) finance short-term assets such as accounts receivable, inventories, etc. Capital markets will be used to refer to those markets where long-term borrowing and equity participation occurs, e.g., bond and stock markets.

Government is extensively involved in many ways in the operations of financial markets. This intervention takes place on both the macro-economic and micro-economic levels. On the macro-economic level, government intervention is largely carried out through the activities of the Bank of Canada in the form of monetary policy initiatives, or through the fiscal initiatives of the Federal government. These policies are designed to achieve broad economic policy goals such as economic stabilization and growth. To achieve these broad goals, Bank of Canada and Government of Canada activities are designed to influence the economy on an aggregate level largely through the manipulation of aggregate demand. Although such policies are of great importance to the economic well-being of the nation, they are of no more concern to public enterprise financial decisions than they are to private sector firms.

Intervention on the micro-economic level is more important to public enterprise finance. Although financial market intervention at the micro level takes many forms, there are two broad categories that are discernable. First, the government intervenes by way of its regulatory function by directly stipulating and prescribing the activities of financial market participants. This is done, for example, through proscription on chartered bank lending activities, the market trading practices of stock brokers and investment bankers, and disclosure rules of publicly traded firms.

Second, the government is also an important supplier of loanable funds and capital participation in businesses. To carry out such activities, the government, either directly or indirectly through a public agency, makes loans, extends mortgages and purchases shares in Canadian corporations. Moreover, the government or its agents can provide loan guarantees to private businesses from a third party lender such as a chartered bank.

The objectives of intervention at both the macro-economic and micro-economic levels are, in general, economic stabilization and growth, more efficient resource allocation, and income redistribution. While both macro- and micro-economic policies are designed, to some extent, to achieve all three sets of objectives, macro-policies are more widely used for stabilization while micro-policies are usually designed to deal with allocation and distribution objectives.

To justify intervention through direct government ownership, i.e., public enterprise, it is necessary to deal with the objectives that are likely to be achieved by such policies. While redistribution is certainly an achievable objective, such policies are beyond the scope of the present study. On the other hand, improvements in allocative efficiency can be analyzed on objective grounds and this is the topic which will now be dealt with.

B. Market Failure in the Financial Sector and the Rationale for Government Intervention

The ways that governments intervene in markets, both real and financial, and the reasons put forth to justify this intervention, are numerous. As discussed earlier, government intervention may be justified if the market mechanism fails to allocate resources efficiently, and markets fail because of a breakdown in the competitive market assumptions. Just as these assumptions are violated in the markets for real goods and resources, they may also be violated in financial markets.

To examine financial market failure, it is useful to review the conditions that are necessary for competitive markets. Those conditions are:

- Competitive, price taking behavior on the part of economic agents
- Price flexiblity and market clearing equilibrium
- Free access to information
- The absence of externalities

Although it is clear that the conditions for efficient resource allocation are severe and certainly not attainable anywhere in the real world, it will be argued here that many of the conditions are closely approximated in financial markets particularly the subset of financial markets known as capital markets. In fact, capital markets may come closer to the competitive model than any other market in the Canadian economy.

The most important condition listed above is that economic agents behave competitively, i.e., they behave as if they cannot influence prices. This assumption is certainly closely approximated in financial markets. Although price manipulation is not unknown, bond and stock markets are characterized by a large number of buyers and sellers and it is highly unlikely that any market participant can act as a price-setter in such markets. Likewise, the assets that trade in financial markets are so numerous in number and type, and the portfolio opportunities available to investors so wide, that product differentiation is not common adding to the depth and competitiveness of these markets.

Next, there is the issue of externalities in financial markets. Remember that the existence of externalities, as explained in the previous chapters, is due to the fact that the economic behavior of some economic agents effect the welfare of other agents through nonmarketable channels. Also, as discussed earlier, the existence of externalities is a common source of market failure in product and resource markets.

While it is certainly true that the transactions and trading behavior in financial markets have widespread and far-reaching effects in the economy, it is important to ask whether these effects are in fact transmitted through the market mechanism or whether they truly represent a type of externality. Since this is an area where a great deal of confusion is likely to arise, it is worthwhile to examine it in greater detail.

A common source of confusion arises from the fact that some people consider any activity that effects others as an externality. For example, the introduction of new financial instruments may open the way to innovative financial activity that may benefit a large number of financial market participants, both actual and potential. Better portfolio opportunities may be present as well as more favorable prices for such opportunities. As stated in Intervention and Efficiency,

> The creation and development of financial markets is, in itself, a source of externalities. The expansion of financial markets in which securities are traded increases the liquidity of these securities, which benefits not only present investors and borrowers but potential ones as well. 1

The author(s) use the above statement as a justification for market failure in financial markets and justification for intervention. But, is this actually an externality in the sense used to justify market failure? In fact, it is clearly not such an externality. The introduction of new financial securities effects others only through their relationships in the market. The author(s) is confusing the nonmarketable versus marketable effects that actions of economic agents can have on others. In this case, while some benefit by the financial innovation of others, these benefits are transmitted strictly through the market and price mechanism. Thus, no market failure is present before or after the financial innovation.

It is easy to see that it is erroneous to define externalities in the above way. Any time a firm (or an individual) introduces a new product, develops a more efficient production process, or opens up a new market, others are

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1. Intervention and Efficiency: A Study of Government and Credit Guarantees to the Private Sector, Economic Council of Canada, 1982.

certainly effected through a newly expanded set of consumption opportunities, or a change in the budget constraint. Based on the former line of reasoning, government intervention of all types could be justified in every market and industry. The truth of the matter is that the effects described above are in no way incompatible with Pareto optimal allocation. As for externalities in financial markets, it is difficult to rationalize the existence of any noticeable nonmarketable externality in financial activity.

On the other hand, there are certain cases where the assumptions of the competitive model are possibly violated. First, there may be problems of divisibility. Divisibility is an important condition for competitive behavior in financial markets. If an investment project is very large and requires a huge initial investment, it may not be possible for private sector financial markets to adequately diversify the risk of the project. In this case, the project may not be able to acquire the appropriate financing or may be required to pay rates that would be higher than otherwise determined in competitive markets. If governments decide that these projects have benefits that are sufficiently high to justify their implementation, then government financing, either in whole of in part, may be justified..

The above market failure is frequently referred to as arising from nondiversifiable risk.[2] When such risk is present however, it is important to keep in mind that this failure of the market does not justify a subsidy to the project itself. Assuming that there are no externalities in the actual operations of the project (externalities in consumption, for example), then the cost-of-capital rate required by the government for acceptance of the project should be equal to the private sector rate for a project of equal risk. Otherwise, such subsidies in financing will supply funds to a project that adds negative value to society's wealth.

A second source of market failure arising from a breakdown in the competitive model is the lack of information. As discussed earlier, information is crucial to the functioning of competitive markets in general, and financial markets in particular. Since information is costly many times, it is possible that financial market participants may not collect sufficient information about a project to adequately access its future prospects. Thus, financing may not be provided to projects at rates that truly reflect the real opportunity cost of capital. This imperfection is largely isolated to credit markets and mostly effects small businesses and consumers. In capital markets, there is little evidence of significant informational inefficiencies.[3]

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[2] See, Intervention and Efficiency.

Third, it is possible that certain financial markets may be characterized by price inflexibility resulting in credit constraints. The chief source of such constraints is inflexibility of interest rates and is generally referred to as credit rationing. In such cases, the supply of credit is less than credit demand, at prevailing interest rates, so that businesses cannot borrow all the funds that they could profitably use. This type of rationing effects almost exclusively bank credit and, since such credit is primarily short-term in nature, credit rationing of this type is not likely to be an important imperfection in determining the long-term financial decisions of large corporations.[4]

Another type of financial constraint falls under the category of capital rationing. Capital rationing exists when a

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3. See, Journal of Business Administration, Fall, 1980.

4. See, e.g., J.-J. Laffont and R. Garcia, "Disequilibrium Econometrics for Business Loans", Econometrica, July, 1977, and C.W. Sealey, "Credit Rationing in the Commercial Loan Market: Estimates of a Structural Model Under Conditions of Disequalibrium", Journal of Finance, June, 1979.

firm sets a limit on the size of its capital budget so that all projects with positive values cannot be undertaken. Although capital rationing should not exist, in practice, there is some empirical support for its existence. Capital rationing seems to arise primarily because a firm imposes internal constraints on the amount of external funds it will raise, or because of capital investment expenditure constraints imposed by various divisions of a firm. In this case, projects with routine value may not be accepted and inefficiency will result. As will be seen later, an important source of capital rationing to public enterprise is government ownership itself.

C. Efficiency in Financial Markets

Although there are many possible ways that financial markets could be inefficient, it is not clear that any of these factors result in any significant degree of misallocation. Most of the imperfections that might be attributed to financial markets have either been misinterpreted by some analyst (e.g., externalities) or are isolated to short-term bank credit markets. Capital markets seem to be largely immune from most of the above problems.

In conclusion, although it is unreasonable to expect that financial markets are perfectly efficient, it is widely accepted that efficiency is a good first approximation of the state of capital markets in Canada. Numerous studies have been conducted using data from the Toronto Stock Exchange (TSE) and, although there is evidence of sporadic and transitory inefficiencies, the results show that Canadian capital markets are generally efficient.[5] For this reason, the analysis presented in the remainder of this study is based on the assumption of reasonably efficient capital markets.

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[5] See Journal of Business Administration, Fall, 1980

CHAPTER VI

FINANCIAL DECISION-MAKING AND PUBLIC ENTERPRISE

VI. FINANCIAL DECISION-MAKING AND PUBLIC ENTERPRISE

A. Public enterprise Defined

Since the purpose of this study is to deal with public enterprise finance, it is necessary to define the terminology to be used in the following sections. In the finance literature, the term "public corporation" would generally refer to a firm whose ownership shares trade in one of several "public" stock exchanges. Although the ultimate owners of the corporations are individual investors, the shares are available for public purchase. On the other hand, "private firms" (sometimes referred to as "closely held firms") do not have ownership shares available to the general public. Instead, such firms are owned, and the shares are held, by a select group of individuals (e.g., a family). thus, in finance the public or private status of a corporation refers to the availability or unavailability of ownerships shares to the general public. It is important in either case, however, that the claimant of the firm's residual income stream be a private individual or group of individuals.

In this study, public versus private will not be used in the above sense. Instead, the term "public enterprise" or "public corporation" will refer to those firms that are owned collectively by the general public through a level of government, either provincial or federal. "Private corporations" will refer, for purposes of this study, to those firms that are owned directly by private investors. Thus, in the case of public enterprise, the claimant of the firm's residual income stream is not an individual, but rather a level of government.

B. The Categorization of Financial Decisions

To conduct its business activities a firm must employ a wide variety of assets. Assets are generally physical, such as machinery and equipment, inventories, accounts receivable, etc. but they also include intangible assets, for example, goodwill, patents, expertise. To acquire these real assets the firm raises funds by issuing securities (liabilities to the firm) through such activities as borrowing, leasing, and share issues. These securities have value because they represent claims on the cash flows generated by the firm's assets. Security holders (investors) buy these claims in order to delay consumption from present to future time periods. Whenever consumption is desired, investors can usually sell the securities in financial markets.

In our economy, financial markets provide the mechanism by which scarce financial resources are allocated among competing uses. Such allocation is optimal if financial markets operate efficiently. The efficiency of financial markets is important since these markets allow firms to raise funds for productive investments, improve the marketability and liquidity of existing securities and facilitate firms in issuing new securities. Financial managers of the firm must, therefore, realize that their decisions will be scrutinized by investors, particularly shareholders of the firm. This scrutinizing, and managers' reactions to it, leads to allocational efficiency.

Corporate decisions that are of interest to the financial analyst can be placed into two closely related categories. First, there are decisions concerning the acquisition of fixed assets, or what is generally called investment decisions or capital budgeting decisions. These decisions require the firm to allocate financial capital for investment projects that meet certain criteria for profitability.

Second, there are decisions that relate to the manner in which investment projects are financed. These are purely financial decisions that reflect how the firm chooses to finance its capital acquisitions. There is generally a continuum of financing alternatives depending on the relative amount of debt versus equity as well as the specific types of debt and equity used. The manner in which earnings are distributed to owners, i.e., dividend policy, also falls under this category of decisions.

C. The Objective of the Firm

The managers of firms do not make decisions in isolation. To achieve the goal of efficient resource allocation, financial market participants must monitor the firm to ensure that firm's managers make only decisions that improve social welfare, at least in a Pareto sense. In a world where consumers/investors prefer more to less, individuals prefer managers to make decisions that will maximize their (the shareholders) utility. Although utility may sound somewhat abstract, it is well known in the finance literature that complete and competitive financial markets lead to a one-to-one correspondence between increasing shareholder utility and increasing shareholder wealth. Thus, investors will prefer wealth maximization which managers can achieve by maximizing the value of the firm. In turn, managers, if they pursue this objective, will make decisions that lead to allocational efficiency by making only those decisions that create positive value for society.

From the manager's point of view, the basic premise is that the interest of common shareholders is of paramount importance. But, while pursuing the specific interest of owners, firms through an "invisible hand" are pursuing the interest of society by ensuring that resources are allocated efficiently. The intuition behind this "invisible hand" is quite straightforward. Firms obtain capital by borrowing money and/or selling ownerships shares in the form of capital stock. This money is in turn used to invest in physical capital that produces goods and/or services for sale to the general public. Investors have a rate of return that they require in order to forego current consumption and bear risk. If the goods produced are not valued highly enough by society to justify the expenditure of funds, then the investment is less valuable than the cost of putting it in place. Clearly, investors are worse off and the firm's value will fall. On the other hand, society is also worse off since scarce resources went into an investment whose output as valued by consumers is not worth the cost. Thus, value maximization corresponds to Pareto efficiency.

The above scenario is not without problems, however. In large corporations there is very often a separation of management and ownership. When the management, as is typical in large corporations, owns a small percentage of the outstanding common stock, the interests of the managers may not always coincide with those of the stockholders. Managers are sometimes accused of being "satisfiers" rather than "maximizers" because their goal may be a level of performance sufficient to ensure their own security and advancement, rather than maximizing the value of the firm for the common shareholders.

The management of the firm can be thought of as the agent of the owners. Shareholders delegate decision-making authority to the managers to act on their behalf. To ensure that management acts in their interest, the shareholders use various incentives and/or monitoring devices. Key executives get stock options that allow them to purchase stock at low prices in the future. Bonus or salary plans are tied to the performance of the firm, and various perquisites (or "perks"), such as company planes or cars, are provided. Monitoring devices include such items as reporting requirements and outside audits. The direct and indirect costs associated with monitoring the actions of management are called agency costs. The impact of agency costs on the firm is not completely understood, but they appear to be an obstacle to the objective of maximizing the value of shareholder claims on the firm.

Ultimately, management's performance is judged in the financial marketplace and reflected in the price of the firm's common stock. Poor management, or a continually low stock price, makes the firm vulnerable to takeover by another firm in an unfriendly merger, or to proxy fights by shareholders. The effect of either of these actions, if successful, may cause some or all of the managers to lose their jobs. So, although the interests of management and shareholders do not necessarily coincide, in general there are competitive market forces at work that make their objectives similar. However, to the extent the managements' interest differ from those of the owners of the firm, the allocationally efficient objective of value maximization may not be fully realized.

These problems are of particular importance when considering public enterprise. The reasons should be obvious. Since there are no ownership shares that trade in financial markets, the scrutiny and monitoring of the market is not present and takeover opportunities are not available. Thus, it is not easy to know whether optimal decisions are being made by management. This problem only stresses the importance of a value related monitoring system for public enterprises.

In practice, the overall objective of maximizing the value of the firm has three important messages for financial managers. First, it is theoretically correct and provides the proper basis for making decisions. Second, since there are obviously some constraints on this objective, managers can only maximize value while taking into consideration these constraints. Third, even if there are constraints, the objective provides a clear and precise frame of reference within which to judge decisions: it provides a standard of comparison and allows managers to determine if their decisions are the best ones under the circumstances. It also allows them to determine how much value the firm is giving up if decisions are not in accordance with the objective.

The major conclusion of this section can be summarized as follows:

- The appropriate criterion against which to evaluate financial decision-making is market value maximization. Since public enterprises have no explicit, measurable market value, managers should make decisions as if to maximize market value.

D. The Basic Elements of Valuation

Now that the firms' objective is evident, the next point to consider is how firms go about attempting to achieve it. The financial manager's criterion against which to evaluate decisions is the value of the firm in the financial marketplace, not in its book value (assets minus liabilities in an accounting sense) or some other figure. Managers are interested in the highest value of the firm as reflected in its market price. How do investors go about valuing an asset such as a firm (which is simply a collection of assets)? The value of the firm to an investor is determined by: (1) the expected magnitude of the future returns or cash flows to be derived from the investment; (2) the timing of these cash flows; and

(3) the risk involved. Cash flows, timing, and risk influence the value placed on any asset, and hence the market value of the firm.

By cash flows, it is meant the actual cash to be received or paid. This is not the same as earnings in an accounting sense. It is important to note that there is a fundamental difference between what accounting is intended to do and what is important for financial decision-making. For finance, the key element is valuation and thus cash flows are paramount. Accountants, on the other hand, focus on record keeping and taxation and thus concentrate on earnings. Earnings, however, are only a clue to the ability of the firm to generate cash flows. Earnings can, in fact, be misleading, since their purpose is to match revenues and expenses in the proper time period based on historical costs. The accounting system is not primarily designed to report the inflow and outflow of cash.

The second fundamental concept relates to the timing of the cash flows. Timing refers to when the cash is to be received or disbursed. If you have the choice of receiving $100 today or $100 a year from now and you are rational, you will take $100 today. This is true even if you do not need the

$100 until a year from now, because by investing the money, you will have more than $100 in one year. Financial managers often want to speed the receipt of cash inflows and delay, to the extent practical, the outflows.

The third concept relates to risk. Risk refers to the uncertainty of future events or the possibility of several more or less favorable outcomes. Other things being equal, rational investors expect a higher return for exposing themselves to greater risk. Likewise, a low risk investment has a low expected return. In financial decision-making, this risk-return tradeoff is a fundamental concern.

Although an all-purpose definition of value is elusive since there is always the debate over the subjective versus objective aspects of value, for purposes of economic and financial analysis it is widely accepted that the value of a particular item (financial or otherwise) is the amount, in money terms, that can be obtained for the item through mutually agreeable exchange. For consumable commodities this is determined largely by the satisfaction gained by the consumer. As discussed earlier, however, financial assets are not consumable directly but instead represent a claim against future consumption. Since the value of a financial asset is based on the amount of future consumption that can be obtained from the asset, the current market value of a financial asset is the present worth of the future income stream afforded by the asset. This in turn is dependent on the three concepts listed above: expected future cash flows, the timing of those cash flows, and the risk of those cash flows.

Since a financial asset represents a contractual arrangement giving the holder a claim against a future income stream, the value of a financial asset is simply the present value of that stream. In specific form, present value can be defined as follows:

$$PV = \frac{C_t}{(1+i)} + \ldots + \frac{C_n}{(1+i)^n}$$

PV	Present value
t	Time subscript for the present and future time periods
C_t	Expected cash flow in time t
i	Required rate of return on the cash flow based on the risk of the flow
n	Number of periods over which the cash flow will be received

Thus, current value is the discounted value of future cash flows. Although equation (1) is in principal easy to operationalize, it is somewhat difficult to put into practice.

The difficulty arises largely from the existence of uncertainty. A key aspect of financial contracts is that the payments occur in the future, sometimes many years in the future, and in most cases these payments are not assured. Even when the nominal payment is virtually certain, as is the case with Federal government debt, the real purchasing power of those payments is uncertain as a result of variations in the inflation rate.

To arrive at the value in equation (1) it is necessary to determine two factors:

- The expected future cash flow from the asset

- The risk of the cash flow in order to appropriately adjust the discount rate

Both factors are difficult to measure and their determination is many times a matter of controversy. In corporate finance, the discount rate is referred to as the cost of capital rate and must reflect the opportunity cost of funds are based on the time and risk of the cash flow in question. Thus, a key element in valuation and thus corporate finance methodology is the determination of the opportunity cost of capital. This is equally true for public enterprise.

E. Capital Costs and the Public Enterprise

As stressed in the earlier parts of this study, a key objective of government policy *vis-a-vis* public enterprise should be to achieve the greatest possible degree of efficiency in resource allocation. In the financial sector this means allocating financial resources to their most socially optimal employments. If capital markets are efficient, the appropriate social cost of capital is the private cost determined in capital markets. In spite of any public policy role of the public enterprise in product markets, any subsidizations or side payments for products or services provided should be paid directly by the government in the markets effected. Capital market subsidization is not an appropriate tool to correct perceived inefficiencies in other markets.

For purposes of illustration, assume momentarily that all the assumptions of the competitive model apply in all markets, real and financial. In this case, the marginal social cost of capital (MSCC) will coincide with the marginal private cost of capital (MPCC). Likewise, the marginal social return on investment (MSRI) is the same as the marginal private return on investment (MPRI). Using Figure 1, the optimal, allocationally efficient amount of investment in the amount, I_o where MSCC = MSRI or, what is the same condition, MPCC = MPRI.

Clearly, in an economy such as the one presently assumed, the decision-making of the public firm should be the same (in terms of investment criteria) as that of any private firm. At stake in this choice is nothing less than the optimal allocational of societies resources between private sector firms and public sector firms. Clearly, the correct capital cost rate for the public firm is the rate of return that would otherwise be earned in the private sector.

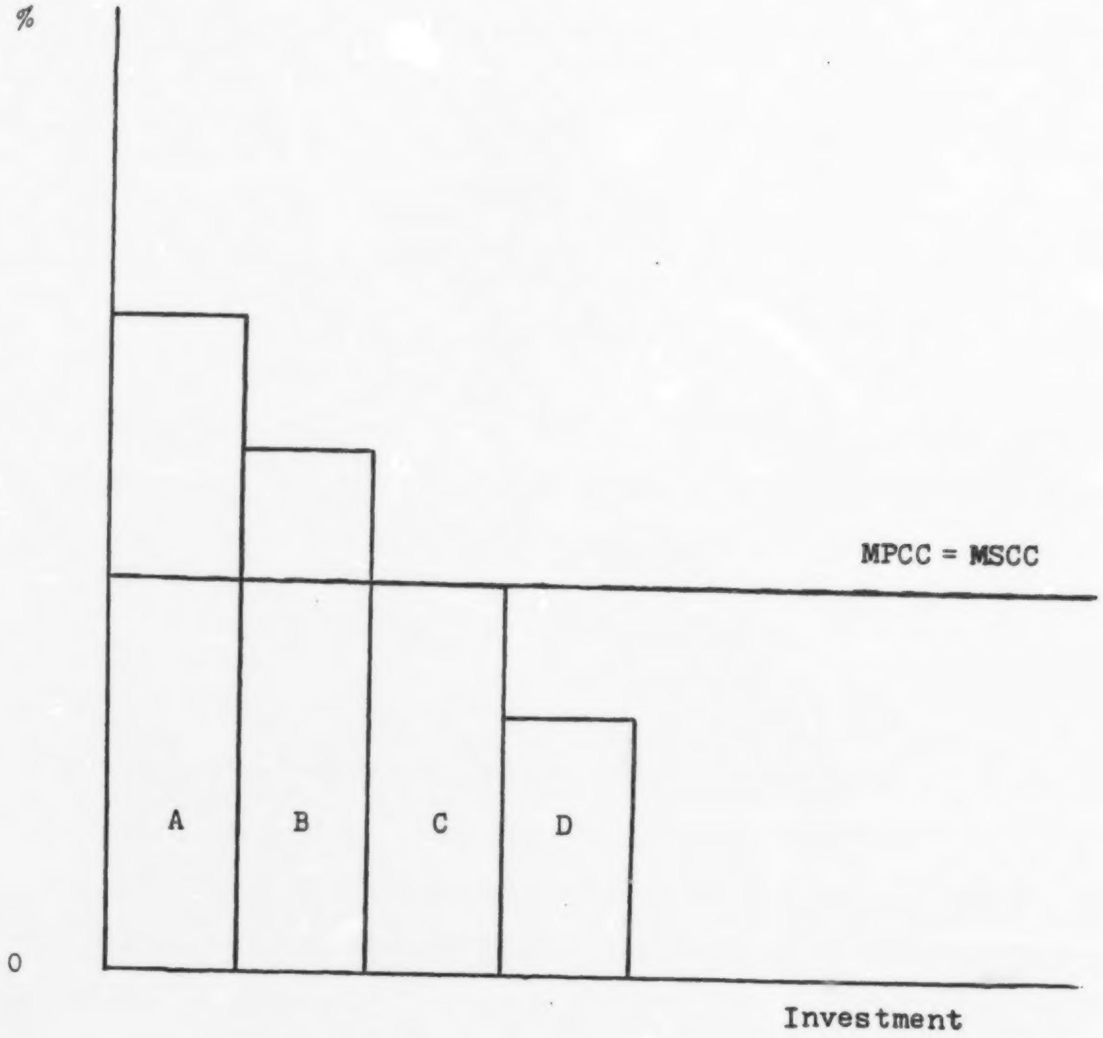
If any economic argument, as opposed to a political argument, is to be used to justify public enterprise, it must rely, as stressed earlier, on the existence of market failure through the breakdown of the competitive model. As argued in chapter IV, any breakdown of the competitive model is not likely to occur in capital markets so that one can be reasonably assured that MSCC = MPCC.

On the benefits side, however, it is not so clear cut. There are many instances where one can rationalize the existence of market failure. Consider, for example, the case of external economies in consumption. In this case, the estimate of private benefits will understate the social benefits that accrue from a given project. Suppose that the firm has five projects available called projects A, B, C, D, and E, and their private returns are given by the solid lines in Figure 2. Clearly, projects A, B and C are estimated to return more than the cost of capital and thus will be accepted. Since projects D and E have lower returns, then they will be rejected on the basis of the value maximization criterion.

Suppose, however, that project E has substantial external consumption economies. Let the broken lines show its true marginal social return. Thus, optimality suggests that project E be accepted in spite of its strictly private rate of return. government policy may be used to induce the firm to accept the project in two ways. First, by providing a subsidy to the revenues received by the firm from the project as that the marginal private return on investment equals the MRSI or, second by subsidizing the cost of capital so that the

Figure VI-1

Investment Projects



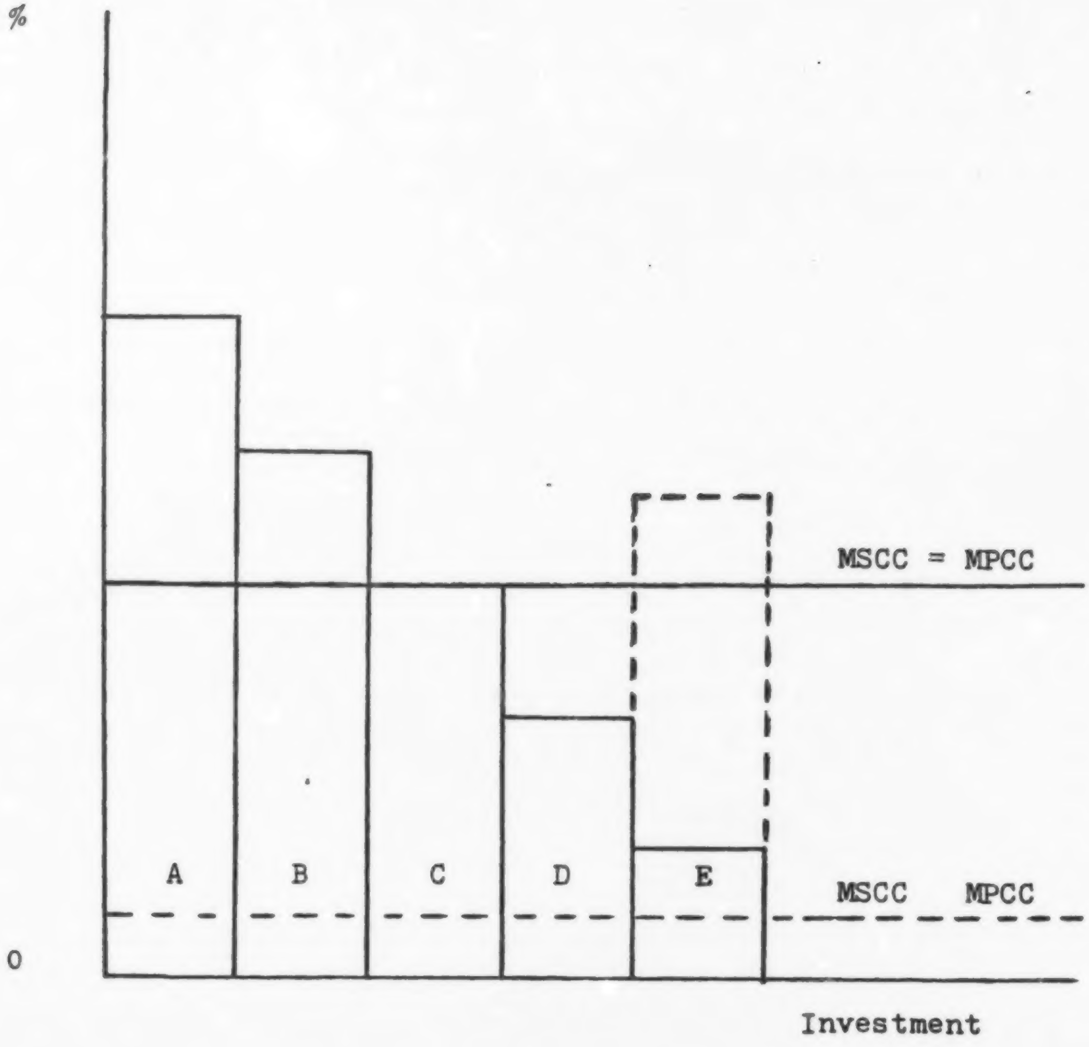
private cost of capital becomes $MPCC_2 < MSCC_1$. In the former case, the final investment selection will be projects A, B, C, and E. This is optimal since only projects with higher social returns than the social opportunity cost of funds will be accepted. In the latter case, however, all five projects will be accepted resulting in an inefficient allocation of financial, and thus real, resources since the financial subsidization will give MPCC < MSCC.

One might argue that it is possible to apply the MSCC MPCC to projects A to D and have a separate cost of MPCC applied to project E. Conceivably, this would lead to an optimal allocation of resources as well. While it is possible conceptually to pursue a rational and optimal public policy in this manner, there are certain practical pitfalls that argue against such policy.

First, the cost-of-capital rate is an important piece of information in the market place and provides information for efficient allocation for large numbers of firms and projects. By subsidizing the cost of capital to one project, the government always creates the danger of providing subsidies to other unproductive projects as a spill over effect. Second, management of public enterprises may themselves become confused by the many cost of capital rates that they are required to use

Figure VI-2

Investment Projects



to assess projects. Third, in most cases, the externality, or other market failure, will be best dealt with by altering relative prices in the market where the failure occurs rather than changing relative prices in an efficient market such as the capital market.

In conclusion, the following proposition is put forth as a criterion for public enterprise finance.

- The appropriate cost-of-capital rate, that which reflects the true social cost of capital, is that rate set by the capital market for private sector firms of equal risk. Any government policy initiatives to further public policy goals or to correct market failure should be taken in the market where the specific policy is being pursued or the failure takes place. The use of capital-cost rates to cross-subsidize certain projects simply confuses the source of, and ultimate solutions to, the inefficiency.

PART II

EMPIRICAL APPLICATIONS OF THE METHODOLOGY

CHAPTER VII

ALTERNATIVE MODELS FOR MEASURING RISK AND RETURN

PART II: EMPIRICAL APPLICATIONS OF THE METHODOLOGY

VII. ALTERNATIVE MODELS FOR MEASURING RISK AND RETURN

A. INTRODUCTION

In the previous chapter, the rates of return set by competitive markets were emphasized. These rates are the criteria by which social public welfare is maximized and therefore, should be employed by government or public corporations. It is recognized that public corporations usually have objectives other than maximization which tends to result in satisfying behaviour regarding profit goals. In order to deal effectively with this divergence in objectives;

> "The trick is to place the crown corporation's satisficing profit goal with the larger context of the government's goal of efficient resource allocation in the economy overall and to relieve the corporation of ill-defined other goals as on going objectives. This means two things: first, crown corporations have to face the same risk return calculus as private sector firms, (emphasis added); second, non-commercial objectives including the generation of income distribution effects and economic externalities must be placed in a special category of goals to be achieved as discrete services for government. Activities directed toward achieving these goals should be costed and evaluated as they arise but they cannot form part of the on-going objectives of the corporation." 1.

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1. Hindle, J.C., "Practical Problems in the Evaluation of Crown Corporation Performance", paper prepared for MacDonald Royal Commission Symposium on Crown Corporations, Ottawa, June 1, 1984. pp.5-6.

In deciding whether or not to expand, contract, or replace the activities of a public corporation, the government must possess some standard that conveys the opportunity cost of resources in the general economy since the use of resources and capital by the public corporation will be a substitute for employing them in the private sector. This notion is central. The requirement is to employ private sector performance as the appropriate standard for public enterprises. The conviction is the establishment of standards and performance measures on a basis that approximates those which confront comparable firms in the private sector.

In the private sector, the expected rates of return may be practically adjusted to serve other, short term, objectives but the long term objective remains the maximization criterion. The initial requirement is that these rates be determined. Only then can rational evaluations concerning deviations from the expected rate be made, in public as well as private corporations. Thus, it is recognized that while the competitive market returns may not, for non-economic reasons, be the final criteria, they are important in evaluating the cost of attaining any other objectives which may assume importance in the operation of a public corporation.

The issue, and possibility of privatization of public corporations adds an important dimension in this particular study to the question of determining acceptable rates of return for public corporations. The sale of equity securities by a currently public corporation, immediately brings it into competition with private firms which use the financial markets for obtaining equity capital. The returns earned by public corporations will by compared by investors to the returns earned by private corporations and security prices will be adjusted accordingly. Thus, the issue of privatization concerning the two public corporations examined in chapters IX and X, Canadian National Railways and Air Canada, provides and additional, and by itself, sufficient reason for assessing the competitive market returns of these public corporations.

Both of the subject public corporations are large, well established, operate in defined industries with competition, borrow in private debt markets, and are going concerns. Consequently, their accounting rates of return are regularly under government and private scrutiny. These conditions, however, may not be present in other types of public corporations. While the measurement of competitive returns remains important, in those cases methodological problems and biases may seriously weaken the primary role which they have in decision-making and assessments. But, even in this possibility, the inclusion of competitive rates of return in the evaluation process can provide a base from which the magnitude of actual or projected deviations can be identified and evaluated.

Measures of capital market performance show significant relationships between the equity returns of private individual companies and the degree of riskiness that their business represents. In general, the higher the degree of risk, the higher the return to equity investment which is observed. The various major methodologies which are used to measure the financial market returns and risks of any private firm are presented and discussed in this chapter.

In contrast, the equity of public corporations does not trade on financial markets and hence, their market returns are not observable. In the next chapter, the approaches which are used for private companies are refined in order to use the financial market valuation process in order to determine competitive returns from public corporations.

B. Fundamental Analysis

Fundamental analysis is the first major approach to valuation which will be described because it is widely practiced by financial analysts and valuators.[2] The methods provide detailed comparisons of performance and company structure with other firms, the industry, and the economy in order to estimate value and changes in value.

The fundamental analysis approach to valuation contains a complete description of the company, by divisions, its products, major suppliers, customers, management team, research and development capability, location of major facilities and so on. Reference is made as to how the business may be affected either favourably or unfavourably by other businesses or industries. In addition, the company's financial condition, past operating results and ownership structure are evaluated.

If there are major changes in the company's operations during the period of valuation, such as expansion of facilities, changes in product line or mix, amalgamations with other entities, or changes in management, these projected effects should be contained in the evaluation.

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[2] See, Cohen, J.B., E.D. Zinbarg, and A. Ziekel, Investment Analysis and Portfolio Management, Homewood, Illinois,Irwin, 1977, and Wise, R., "The Essentials of Valuation Report Writing", CA Magazine, November, 1984.

Capital structure is particularly important. The leverage effect of long term debt can make a significant difference in projected earnings per share and in overall corporate worth. The production and sales facilities should be considered in terms of number, age, obsolescence, location and any new development that might cause geographic disposal or concentration.

The past sales record should be tracked. The trend of sales should be examined so that price increases can be distinguished from unit sales trends. Moreover, the management team requires evaluation in order to determine whether the present management would continue if there were a sale of corporate ownership.

All relevant economic facts bearing on the future prospects of the company being valued need to be considered. The degree of competition as well as the company's profit trend and those of its competitors help to determine whether profitability is changing industry-wide or just the relative positions of the companies. These considerations are relevant in choosing the capitalization rate of the firm. Whether there is ease of entry into the marketplace by other firms may also be an important factor.

The company's sources of supply should be considered as well. The extent to which the firm relies heavily on only a few suppliers will have a bearing on the risk of the company.

Much of this type of industry information is generally available from trade publications, Statistics Canada, brokerage houses, banks, and government reports and studies. These analyses include summaries of the company`s key financial statement ratios and a comparison of them with industry standards, and against its past performance.

Fundamental analysis may employ a number of different valuation methods. The principle ones are the asset and earnings approaches but sometimes other methods are used, such as cash flow, discounted cash flow or sometimes, "rules of thumb". For example, divisions of companies may require different valuation methods.

If, because of the nature or circumstances of the company, the earnings approach is applicable, the starting point is with the balance sheet. Generally, the assets approach is used where (1) liquidation is contemplated (2) the company is primarily a holding company or (3) the company has no or negative earnings to be capitalized. The valuation would be based upon net equity (assets minus liabilities) with the adjusted current values of assets and liabilities.

The earnings approach attempts to establish earnings power, ie. likely future earnings. For this purpose, earnings require:

(1) Adjustments that will reflect the economic earning power of the business, irrespective of the particular accounting procedures and principles employed (such as depreciation policy, amortization of intangibles, capitalization of expense items, and expensing of capital items.

(2) Adjustments that recognize that reported profits relate to past, historic operations to recognize the effects of new products or services, labour agreements, or major capital commitments.

(3) Adjustments for transactions that are of a non-arm's length or uneconomic nature such as related party transactions, subsidies preferential borrowing rates, bonuses, or management salaries.

The usual approach uses a simple average of the last three to five years fiscal adjusted earnings as the bases for arriving at permanent or maintainable earnings. In addition, the maintainable earnings must be calculated after taxes, adjusting the earnings by the appropriate tax rate.

The usual approach uses a simple average of the last three to five years fiscal adjusted earnings as the basis for arriving at permanent or maintainable earnings. In addition, the maintainable earnings must be calculated after taxes, adjusting the earnings to determine a price per share.

Having calculated the earnings figure, this is capitalized to determine equity value as follows:

$$E_t = NI_t / k_e$$

where E_t is the equity value.

NI_t is the numberable net income to common shareholders.

k_e is the capitalization rate.

The value per share is calculated by dividing E_t by the number of shares in order to determine a price per share.

The capitalization rate is typically the most controversial aspect of this approach being often disputed between buyers and sellers. The rate will vary depending upon whether the equity is widely, or closely held, or whether or not it trades at all. Comparable rates of return for alternative investments are also examined for the valuation period or date.

This approach does not contemplate the existence of possible "special purchasers," that is, potential buyers who would be prepared to pay a premium for the businesses' assets/shares because of the anticipated synergies resulting from acquisition. Further, fair valuations do not consider the possibility that the shares may be sold through special purchases arrangements such as executive or employee plans.

The fundamental analysis approach is a complex process, depending for its accuracy and usefulness on the detail of the investigation and the skill of the investigator or analyst. Final valuations are, in spite of the apparent structure, typically highly subjective and unsupported by any process founded in theory. The range of error can be great and inferior to employing even relative simple mathematical or statistical models for valuation.[3]

C. Dividend Capitalization

The dividend capitalization approach to valuation was one of the first approaches to depend upon a rationale grounded in theory and to be examined empirically as to its validity. It focuses on the projected returns in the form of dividends to the shareholders of the firm.

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[3] See, Niederhoffer, V. and P.J. Regan, "Earnings Changes, Analysts Forecasts, and Stock Prices", Financial Analysts Journal, May-June, 1972, and Critchfield, T., T. Dyckman, and J. Lakonishok, "An Evaluation of Security Analysts Forecasts", Accounting Review, July, 1978.

Dividend payments (D) for shares are neither contractual nor constant. Rather, investors realize that the growth rate of their dividend payments, g, will vary over time. In any given year, for example, growth will depend upon such constantly changing factors as the national income, the efficiency of the firm, the proportion earnings which the firm chooses to retain and invest, and so forth.

At any point in time, however, investors form a projection of future growth rates i.e. the expected normal growth rate of the firm. If investors want a return on their investment of k_e with the expected growth rate of dividends, g, then the price P_t of the equity security is determined as follows:

$$P_t = \frac{D_t (1+g)}{(1+k_e)} + \frac{D_t (1+g)^2}{(1+k_e)^2} + \ldots\ldots + \frac{D_t (1+g)^{n-1}}{(1+k_e)^n}$$

where P_t is the revenue expected by investors at the end of period t. Assuming that, n, the life of the firm is very large, this equation reduces to

$$P_t = \frac{(1+k_e)}{(1+g)} - P_t = \frac{D_t}{(1+g)}$$

or finally,

$$P_t = \frac{D_t}{k_e - g}$$

A necessary condition for valuing a share of a firm is that $k_e > g$. This equation also indicates that the higher the growth rate of the dividend or the larger the current dividend, other things being equal, the higher the price of the stock, and conversely, the higher the discount rates the lower the price of the stock.

Letting r be a constant return on assets, and b, a constant proportion of earnings retained in the firm, then g is expressed as rb and the dividends paid to shareholders as

$$D_t = (1-b)\ r\ A_t$$

and the valuation model becomes,

$$P_t = ((1-b)\ r\ A_t)/(k_e - g)$$

The next step is to determine K_e, the discount rate. K_e is determined from an interest rate, i, which represents a pure time preference interest rate and a measure of the riskiness associated with the growth expectation. Thus,

$$K_e = K(i, \text{risk})$$

The logic of this construction is that an investor always has available the alternative of putting his funds into a safe, long term investment that yields i. The purchase of common shares involves risk that the expected rate of growth of the corporation will not materialize. Thus, shareholders will adjust this rate downwards by some amount because of inherent uncertainty. The greater the risk associated with the growth rate becomes, the higher the rate of discount that shareholders will apply to the future stream of dividends. The risk component of the discount rate can be expressed as sVar(g), where s represents the risk aversion preferences of shareholders and Var(g) represents the variance in the growth rate. The discount rate is therefore specified in the linear form.

$$K_e = i + s\,\mathrm{Var}(g)$$

In other words, the capitalization rate is the sum of two terms, i, the rate of interest an investor could earn on a risk-free security, and s Var(g), which is a measure of the riskiness of the security. Thus, combining this formulation in the valuation model, the price of an equity security becomes:[4]

$$P_t = \frac{(1-b)\, r\, A_t}{i + s\,\mathrm{Var}(rb) - rb}$$

The valuation problems with this formulation are different, depending upon whether it is used from the point of view of the investor or the firm. From the position of the firm, b, A_t, i, Var(rb), and r are known. What is not known is s, the risk premium which investors would apply to the risk of return. In empirical work, the risk premium must be estimated.

From the viewpoint of the investor, however, i, s, and A_t known but the expected retention rate (b) and return on assets (r) must be estimated in order to determine P_t, the value of the firm's shares. In addition, the risk premium at any point in time is related to the risk and return of the other opportunities which investors have to invest. Investors can maximize their return by forming portfolios of securities thereby diversifying the risks, and increasing the expected return and reducing the risk of their portfolio. Consequently, the premium which is required depends upon risk of the firm in relation to other firms in the market. In order to calculate this factor, market model approaches must be employed.

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[4] See, Modigliani, F., and M. Miller, "The Cost of Capital, Corporation Finance, and the Theory of Investment", *American Economic Review*, June, 1958, and Gordon M.J., *The Investment, Financing, and Valuation of the Corporation*, Homewood, Illinois, Irwin, 1962.

D. The Market Model Approach

In recent years and currently, the empirical examination of equity value has relied heavily on the market model and the capital asset pricing model. Both models are simplification of a more general model, and in this sense both models make the following assumptions.[5]

1. The multi-period consumption investment decision can be reduced to a one-period decision involving current consumption and terminal wealth. The multi-period problem can be reduced to a one period decision under very general conditions. Hence, the individual investor can act as if he is solving a one-period problem.

2. The objectives of choice can be defined in terms of two-parameters of the distribution of security returns. The two parameters are the mean and standard deviation of returns. This assumption actually involves several additional assumptions.

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[5] See for the primary works, Fama, E. "Efficient Capital Markets, A Review of Theory and Empirical Work", Journal of Finance, May, 1970, Litner, J.L., "Security Prices, Risk, Maximal Gains from Diversification", Journal of Finance, December, 1965, Markowitz, H., "Portfolio Selection", Journal of Finance, March, 1952, and Mossin, J., "Equilibrium in a Capital Asset Market", Econometica, October, 1966.

(a) The utility of the outcome is independent of its state labeling, i.e. good times versus bad times.

(b) The first derivative of the utility function for wealth is assumed to be positive, and the second derivative is assumed to be negative. That is, the investor is assumed to be risk averse.

(c) The probability distribution of all possible portfolios is assumed to be of the same form.

3. The capital pricing models derive certain conditions for equilibrium in the pricing of securities. These assumptions are perfect capital markets and homogeneous expectations. The properties are (a) no buyer or seller of securities is large enough to affect price (b) no external drains on wealth (c) all investors have equal and costless access to information.

4. The capital asset models, also assume the existence of a riskless rate at which all individuals can borrow and lend.

The Market Model

The market model is a specification of the stochastic process generating individual security returns. Simply, the model asserts that security is expressed as:

$$R_{it} = a_i + B_i R_{Mt} + u_{it}$$

where:

$$E(u_{it}) = 0$$

$$\mathrm{Cov}(R_{Mt}, u_{it}) = 0$$

$$\mathrm{Cov}(u_{it}, u_{jt})$$

R_{it} = return on security i in period t.

R_{Mt} = general market factor in period t.

u_{it} = the stochastic portion of the individualistic factor reflecting that portion of security i's return which varies independently of R_{Mt}.

a_i, B_i = intercept and slope associated with the linear relationship

The market model asserts that the stochastic portion of a security's return can be decomposed into two elements, a systematic component ($B_i R_{Mt}$) which reflects common movement of a single security's return with the market factor, and an individualistic component, u_{it}, which reflects that portion of a security's return that varies independently of the market factor.

The motivation for the model can be provided by viewing events as being classified into one of two categories: (1) those events that have economy wide impacts, which are reflected in the market factor, and (2) those events which have an impact only on one particular security. The absence of a third class, industry wide, is suggested by previous research not to be a serious misspecification of the model.[6]

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6. See King, B., "Market and Industry Factors in Stock Price Behavior", Journal of Business, January, 1966.

The variance of a security's return can differ from that of other securities because of one of two factors B_i or u_{it}. The first factor is referred to as the individualistic or avoidable risk of a security, because that risk can be driven to zero through diversification.

The B_i is the risk of the security and measures the security's sensitivity to market wide events. It is called the systematic or unavoidable risk because it is that portion of the variance of the security's return that cannot be diversified away by increasing the number of securities in an investor's portfolio.

Capital Asset Pricing Models

Capital asset pricing models essentially start from the assumption that investors are generally risk averse and show that, in equilibrium, capital assets will be priced such that:

$$E(R_{it}) = R_{ft} + b_i [(R_{Mt}) - R_{ft}]$$

$$b_i = Cov(R_{it}, R_{Mt}) / Var(R_{Mt})$$

where $E(R_{it})$ = expected return of asset i for period t

R_{ft} = rate of return on a riskless asset in period t

$E(R_{Mt})$ = expected return on the market portfolio.

The capital asset model states that the only variable which determines differential expected returns among securities is the risk coefficient, b_i. The model further asserts that there is a linear relationship between b_i and the expected return, such that the higher the risk, the higher the expected return.

Under some simplifying assumptions, the B_i from the market model will be approximately equal to the b_i from the capital asset pricing model. (a) The variance of the market factor is essentially equal to Var R_{Mt}, the variance of the return on the market portfolio. (b) Every security constitutes a small fraction of the market portfolio. (c) B_i and b_i are stationary over time. (d) If it is further assumed that R_{ft} is stationary over time, then there will be virtually complete compatibility between the two models.

Empirical assessments are obtained from a time series, least squares regression of the following form;

$$R_{it} = a_i + b_i R_{Mt} + e_{it} \qquad t = 1, T.$$

where R_{it} and R_{mt} are ex post returns for security i and the market respectively, and where e_{it} is the disturbance term in the equations:

$$R_{it} = \{P_t + D_t - P_{t-1}\}/ P_{t-1}$$

where P_t = the security price at time t

D_t = the dividends per share during period t

The assessment of b_i from a time series regression assumes that b_i was stationary during that period. Empirical evidence is consistent with the stationarity assumption. The empirical evidence also indicates that the resulting equation conforms well to other assumptions of the linear model (i.e., linearity, serial independence of the disturbance terms and homoscedascity). The distribution of the residuals tends to be "flatter" than would be expected under normality. However, it has been shown that the distributions are stable with finite expected values and that the least squares estimates of b_i are unbiased and consistent, although not efficient.

Capital market approaches present a method grounded in theory for relating firm to market returns under portfolio diversification. These techniques and theories have been slow to evolve and gain acceptance by practitioners.

One criticism has been that market models of security returns do not include the fundamental business and financial features of the company. The first important study of the relationship between accounting and market measures of risk was undertaken by Beaver, Kettler, and Scholes. Their findings strongly suggest that accounting measures of such measures as the dividend payout ratios and capitalization ratios are in fact impounded in market risk measures. These same conclusions have been confirmed by several later studies.[8]

The substantial weight of empirical evidence and theoretical construction of market model techniques augurs well in its favour. They have practical applications in investment and portfolio analysis. While it may be possible to provide evaluations using chartist, rules of thumb, or surrogates of market measures, the initial formal approach of market models carry with them the important attributes of validity, support, and reflect current thinking and research in the field of security valuation.

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7. Beaver, W., P. Kettler, and M. Scholes, "The Association Between Market Determined and Accounting Determined Risk Measures", The Accounting Review, October, 1970.

8. Rosenberg, B., and J. Guy, "Prediction of Beta From Investment Fundamentals, Financial Analysts Journal, July-August, 1976, and Rosenberg, B., and W. McKilben, "The Prediction of Systematic and Specific Risk on Common Stocks", Journal of Financial and Quantitative Analysis, March, 1973.

E. Cost of Capital

In addition to seeking the relationship between market return and risk for investors, the results which are obtained from market models have another purpose, within the firm. Managements of companies regularly make decisions regarding investments, dividends, abandonment, etc., which affect the value of the firm. The market requirements to mainatin firm value are an important part of these decisions. Within the firm, the internal required rate of return on investment, which takes into consideration the market return, is referred to as the Cost of Capital. It is to this subject that this last section is directed.

The cost of capital of the firm is the critical input to most major decisions. It is the cut-off rate, which for any decision provides the minimal expected return. Decisions involving investments which return less than cost of capital, decrease the value of the firm and represent an inefficient allocation and usage of resources. Investments with projected returns higher than the cost of capital, should be undertaken as they maximize value of the firm, and also, resources are directed to higher return investments consistent with an efficient allocation of resources.

In a recent study, respondents from 177 companies reported their usage of the cost of capital as an evaluation measure.[9] As Table VIII-1 indicates, 92.7% of the firms used the cost of capital figure in deciding whether to undertake new investments or projects. The figure is also widely used in abandonment, leasing, bond refunding, and valuation decisions.

TABLE VII-1

Cost of Capital Application
by Private Firms

Decisions	Percentage of Respondents
New Projects	92.7%
Abandonment of Existing Projects	44.6
Leasing	64.4
Bond Refunding	34.5
Estimating the Firms Value	44.1

The cost of capital is not only an efficient gauge and guide to resource allocation from the perspective of society, but also is widely used in private practice by value maximizing firms. The optimum level of investment for the expected return is a criteria by which firms compete with each other.

While decisions may ultimately be affected by other factors such as judgment, the prerequisite is that the cost of capital be the basis of such decisions. As this is the case in private firms which seek debt and equity capital from the markets directly, or through intermediaries, and compete for sources of capital, public corporations which seek privatization must similarly have an evaluation criteria consistent with its competition in those markets. Consequently, the cost of capital is a measure which cannot be ignored.

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[9] Gitman, L.T., "Cost of Capital Techniques Used by Major U.S. Firms: A Survey and Analysis", *Financial Management*, Spring, 1982.

There has been discussion, and in fact, controversy regarding the measurement of the variables to be included in the cost of capital calculation for any corporation. Financial theorists generally recognize that value is determined by markets which evaluate expected risks and returns. This recognition is consistent with current economic practice as Table VII-2 suggests from a recent survey of practices.[10]

In this table, 87% of the firms use the weighted average cost of capital calculation as opposed to other measures. In addition, 80.1% of the firms based their calculations on either their target or current market values. Since current practice and theory are consistent in utilizing market prices, the approach which is utilized in this study is consistent with the accepted approach.

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[10] See also, Fremigan, J.M., "Capital Budgeting Practices: A Survey", Management Accounting, May, 1973, and Gitman, L.J., and J.R. Forrester, "A Survey of Capital Budgeting Techiques Used by Major U.S. Firms", Financial Management, Fall, 1971.

TABLE VII-2

Approach and Weighting Schemes in Cost of Capital Calculation

Approach	Percentage of Respondents
Use cost specific source of financing planned for funding the alternative	16.9%
Use weighted average cost of capital based upon book value weights	16.4
Use a weighted average cost of capital based upon target capital value weights	41.8
Use a weighted average cost of capital based upon current market value weights	28.8
Use a weighted average cost of capital based upon some other scheme	0.6
Total	104.5%

In using market values, the definition of the major components of the cost of capital for a firm become;

K_i = the cost of debt capital

K_e = the cost of equity capital

D = the market value of the firm's debt

E = the market value of the firm's equity

$$\text{Cost of Capital} = K_i \frac{D}{D+E} + K_e \frac{E}{D+E}$$

Two of the four variables which are necessary in order to measure the cost of capital are readily determinable. They are K_i and D, the cost and market value of the firm's debt. For any private or public corporation which publicly borrows funds through the markets, the firm's rating (Aaa), interest rate, and debt structure are reported thus permitting assessment. For this reason, further discussion of the cost of debt and the market value of debt will be withheld until the practical application of these measures are discussed in the next chapter.[11]

The two remaining measures in the cost of capital calculation are of immediate and greater concern. They are the cost of equity capital, K_e, and the value of equity capital, E. For a private corporation, these would be known values having been continually established by the financial markets. As with debt, the valuation of equity requires equity market information. Market data, however, do not exist for a non-traded firm. Public

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11. Since interest is a tax deductable expense, the cost of debt is normally stated as an after tax rate. The subjects of this study, CN and Air Canada, are taxable on their profits. However, as a result of loss carry overs, CCA deductions, etc., they have not had taxable income and are not likely to have in the near future. Thus, the tax rate is not included in the cost of capital formulation.

corporations are not market traded firms and therefore, the practical valuation of these firms must proceed through analysis and inference rather than direct observation of market prices for the equity. This procedure requires determining the yield at which a non-traded firm would sell, as if it were publicly traded. Thus the prior, but related issue is equity valuation from which, the cost of capital calculation can then proceed.

For the reasons stated in this chapter, the market valuation model approach will be used. As the discussion has endeavoured to point out, it is not the only way in which this can be accomplished, but given the state of the art, it has the greatest face validity. The subject of the next chapter is a presentation of the market valuatation methodology which will be applied to non-traded or public corporations in Chapters IX and X.

CHAPTER VIII

MEASURING RISK AND RETURN FOR PUBLIC ENTERPRISE

VIII. MEASURING RISK AND RETURN FOR PUBLIC ENTERPRISE

A. INTRODUCTION

The purpose of this chapter is to describe the methodology of valuation which will be applied to the cases, Air Canada and Canadian National Railways, in the next two chapters. There are several major steps in this process which begins with the financial performance of the corporation and ends with the valuation applied to the Cost of Capital (COC). The procedures will be applied to both of the public corporations as case examples of the methodology.

Because public corporations do not have financial market values, ie. they do not trade on stock markets, the analytical method must proceed according to a process of deduction and inference. Deduction is required because each step depends upon the previous step. The process of inference is also needed since the analysis proceeds from known values, ie. the current financial performance of the company, to the unknown market value and the cost of capital based upon market values.

The practical valuation of any corporation, and especially a large one which is government owned, can be a time consuming and costly undertaking. Constraints in time, costs, and subsequently, expectations, dictate that in this report, the bounds be practically drawn. The intention therefore, in this chapter, is to present the process of valuation and its rationale, and to discuss where the major complexities will arise in its application.

B. PROCESS OF MEASURING RISK AND RETURN

1. Operating Performance

The major variable of importance is Net Operating Income of the corporation, henceforth referred to as NOI. NOI refers to net income from operations and appears in the income statement of every company prior to charges for debt, taxes, and unusual gains or losses. It measures the operating performance of the firm for the period. From the NOI, the growth rate of NOI is calculated as follows;

$$(1) \qquad g^{NOI}_{j,t} = (X_{j,t} - X_{j,t-1}) / X_{j,t-1}$$

where $g_{j,t}$ = the growth rate of NOI of firm j in period t,

$X_{j,t}$ = the NOI of firm j in periods t and t - 1.

If the earnings of the firm grow at a constant rate over time, and if certain other conditions to be considered below are satisfied, the share price and dividends of the firm are expected to grow at the same rate. Furthermore, the realized rate of return on the share will be constant and equal to the expected rate of return, that is, the yield at which the shares of the firm sells at the start of the period.

In fact, the realized rate of growth in earnings and the realized return on the firms shares will tend to fluctuate in a range around their expected values from one period to the next. Changes in the realized return on the share will be accounted for largely by changes in the realized rate of growth in the price per share. This relationship is stable as long as the implicit assumption that the rate of change of the growth rate of NOI is zero, ie. the expected growth rate remains constant. The result is that variations in the growth rate of NOI and the returns to the shares of the corporation will be highly related.

However, the growth rate of the firm only captures part of the variation in share prices. Specifically, since dividends are paid out of after interest and tax income, NII, dividend expectations are derived from this measure of the growth rate in earnings to shareholders. The growth rate in earnings to shareholders, which reflects the projected dividend stream, is calculated as follows:

$$(2)\quad g^{NII}_{j,t} = \frac{[X_{j,t} - iB_j][1 - T] - [X_{j,t-1} - iB_j][1 - T]}{[X_{j,t-1} - iB][1 - T]}$$

$$= [X_{j,t} - X_{j,t-1}] / [X_{j,t-1} - iB]$$

The growth rate of NOI and NII differ only in the interest payments, iB, where i is the interest rate on debt and B, the amount of the debt of the corporation when the taxation rate, T, remains constant, as it typically does. In fact, the amount of interest and debt change affect the growth rate of NII. The change in interest payments introduces variability in the form of financial risk in a levered firm, that is, a firm with long term debt in its financial structure. Financial risk can be altered by the firm through changes to its capital structure. Consequently, in order to take account of this effect on share returns, the growth rate of NII becomes another important variable in the valuations.

A precise calculation of the growth rates of NOI and NII requires that both measures be accurately determined. In the following chapters, NOI and NII are taken from the financial statements of the corporations under review. The prerequisite is that the NOI and NII figures are fairly presented in the financial statements of the corporations. Practically, the income figures should be adjusted specifically to compensate for prior period adjustments, changes in accounting policies, practices, and valuations which have occured over time. The NOI and NII of each period should be consistently measured in order to determine the comparative inter-period figures. Changes in depreciation, pensions, contractual grants, interest and other changes in accounting practices need to be adjusted in order to reflect the comparative NOI and NII streams. While there is no pretense at the difficulty of this process, it remains a necessary prerequisite in order that the growth rates reflect meaningful, permanent values rather than transient, artifically adjusted values.

2. Systematic Risk of Growth Rates

The process described above for one firm also applies to all firms. If $g_{j,t}$ is taken as the growth rate of firm j in period t and $G_{M,t}$ is the growth rate of a diversified portfolio of firms in period t, then by regressing $g_{j,\cdot}$ on $G_{M,\cdot}$ over a period of time, we obtain:

$$(3) \quad g^{NOI}_{\substack{j,t\\NOI}} = \hat{a}^{NOI}_{j} + \hat{b}^{NOI}_{j} G^{NOI}_{M,t} + e_{j,t}$$

where, $\hat{b}^{NOI}_{j}$ is an estimate of the covariance-variance ratio or systematic risk of company j, based upon the rate of growth in the corporations NOI as compared to other firms and $\hat{a}^{NOI}_{j}$ is an estimate of the intercept term and $e^{NOI}_{j,t}$ is the error term.

Similarly, the estimates for NII are obtained in the following:

$$(4) \quad g^{NII}_{j,t} = \hat{a}^{NII}_{j} + \hat{b}^{NII}_{j} G^{NII}_{M,t} + e_{j,t}$$

where $\hat{b}^{NII}_{j}$ is a measure of the systematic risk of firm j based upon the NII measures as compared to other firms, $\hat{a}^{NII}_{j}$ is the intercept estimate and $e^{NII}_{j,t}$ is the error term.

The result is two measures of systematic risk, operating and financial, for the subject firm j. When the same procedures are applied to all firms individually, using their growth rates as the dependent variable, measures of the systematic risk of their earnings streams are generated based upon their growth rates in NOI and NII.

This procedure places the systematic risk of the non-traded firm (Crown Corporation in this study), in a comparative context with all other firms which publicly trade, based upon their operating characteristics.

This step requires a large sample of firms which publicly trade. The comparative analysis implies that projected growth rates for the non-traded firm would not be substantially altered by becoming publicly traded. If however, a non-traded corporation was to substantially alter its debt structure, and hence interest payments or alter its operations in such a way as to affect its operating growth, these changes would have to be reflected in the growth rates. In addition, while the most straight forward model of the relational process of growth rates of the subject firm to those of other firms is represented as linear, other relational models may prove to be superior under investigation, and could therefore, be used.

3. Risk Classes

Theidentification of the systematic risk coefficients, $\hat{b}^{NOI}_j$ and $\hat{b}^{NII}_j$, for the non-traded firm and for each of the traded firms permits the classification of risk. Procedurally, the NOI risk coefficients of all the firms are ranked according to their size and then, divided into groups. The NII risk coefficents for the same firms are similarly ranked and divided into the same number of groups. The groups form a matrix such as is represented in the following diagram.

RISK CLASSES

$\hat{b}^{NII}$

$\hat{b}^{NOI}$

LOW	1	2	3	M	HIGH
1					
2					
3		X			
M					
HIGH					

The cells represent the risk classes and the traded firms are identified which belong to each cell. The risk class of the non-traded firm is identified by matching its risk coefficients of those firms within the cells of the matrix. The position of the symbol **X** in the matrix represents a possible location of the non-traded firm and demonstrates the identification procedure.

All firms in the same cell are in the same risk class as the non-traded firm, X. It is this reduced set of traded firms in the same risk class as the non-traded firm which have the same operating and financial risk characteristics and which are the subject of further analysis and comparison with the non-traded firm.

Procedurally, the placing of the non-traded firm in its appropriate risk class with a reduced set of traded firms is a direct classification procedure dependent upon identification of the risk classes. The appropriate number of risk classes, in the example M x M, is a function of the total number of traded firms included in the analysis. A fewer number of firms would mean that fewer cells would have to be used, thereby increasing the standard deviation of the final results. In addition, the number of cells or classes is determined empirically. The variance of the risk measures within classes should be statistically smaller than between classes requiring analysis of the sensitivity of forming the risk classes.

C. Identification of Market Risk

The systematic market risk of any traded company is calculated from the valuation model as follows.

(5) $$ke_{j,t} = E(R_{j,t}) = R_F + B_j \, [\, E\,(R_{M,t}) - R_F \,]$$

In this expression,

B_j = the systematic risk of the shares of company j, more precisely, the covariance between $R_{j,t}$ and $R_{M,t}$ divided by the variance of $R_{M,t}$.
B_j, refered to as Beta, is $\mathrm{Cov}\,(R_{j,t}, R_{M,t}) / \mathrm{Var}\,(R_{M,t})$

$E(R_{M,t})$ = the expected return on the market portfolio

R_F = the risk free interest rate

$E(R_{j,t})$ = the expected market return of company j in period t

The theoretical and empirical validity of this model are well established within the financial management literature to the extent that, using anything but this approach to market valuation, as the inital procedure would be treated as suspect by empiricists.

The market systematic risk of firm j, B_j, is customarily measured by means of regression statistics. The resulting regression equation is of the form:

$$(6) \quad R_{j,t} = \hat{A}_j + \hat{B}_j R_{M,t} + E_{j,t}$$

where $\hat{A}_j$ is the intercept term, $\hat{B}_j$ is the estimate of Beta for firm j, and $E_{j,t}$ is the error term. $R_{M,t}$ is the realized market return of the portfolio of market traded companies.

$R_{j,t}$ is the realized rate of return of company j in any period t, calculated as follows;

$$(7) \quad R_{j,t} = (P_{j,t} + D_{j,t} - P_{j,t-1})/ P_{j,t-1}$$

where,

$D_{j,t}$ = are the dividends per share of company j in period t

$P_{j,t \text{ or } t-1}$ = the market price per share of company j at time t and t-1.

These values are the actual observed share prices and dividends for the traded firms which are obtained from published stock market performance reports.

In order to measure the market risk, it is first necessary to calculate $R_{j,t}$ for each of the (n) traded firms in the same risk class as the non-traded firm for each period (t) of the analysis. The individual period returns of each of these firms are combined into an efficient portfolio of returns as follows;

(8) $R_{p,t} = w_{1,t} R_{1,t} + \ldots\ldots + w_{n,t} R_{n,t}$

where,

$R_{p,t}$ = the return to the portfolio of firms in the same risk class as the non-traded firm in period t.

$w_{\cdot,t}$ = are the weights assigned in combining the n firms in the portfolio.

The $R_{p,t}$ are then used in a regression equation with the return to the market, $R_{M,t}$, in order measure the $\hat{B}_p$ of the portfolio of traded firms in the same risk class as the non-traded firm.

(9) $R_{p,t} = \hat{A}_p + \hat{B}_p R_{M,t} + E_{p,t}$

This market valuation analysis uses the relationship between the Betas calculated from the growth of NOI and NII and the Betas measured from the securities markets. The implict functional relationship is as follows.

$$(10)\quad \hat{B}_{p,.} = x_{\hat{a}_{p,.}} + x._{p,.}\,\hat{b}^{NOI}_{p,.} + x._{p,.}\,\hat{b}^{NII}_{p,.}$$

where all previous Beta symbols apply and the x. are the relational coefficients between the market and accounting betas. This model assumes that over the long term, the betas are strongly and positively related based upon the permanent, rather than transient, relationship between market and accounting measures of risk. Other empirical studies have demonstrated a high and significant correspondence between earnings and market betas at the .001 level. Table VIII-1 is taken from another empirical study in which market and accounting betas were compared. The correspondence between the two systematic risk measures are easily observed. In that study, $\hat{c}$ is the earnings beta instead of $\hat{b}$ which is currently used. $\hat{B}$ has the same meaning in both studies.

TABLE VIII-1

Sample and Estimates of Systematic Risk Measures for Earnings Growth ^c and Security Rates of Return ^B

Company	$\hat{c}$	$\hat{\beta}$
Alcan Aluminum	.625	1.082
Allied Mills	.000	.416
Ambac Industries	2.605	1.699
Ametek	1.794	1.365
Armstrong Cork	1.293	.936
Beneficial Finance	.168	.682
Borg Warner	2.713	.827
Chesapeake and Ohio Railway	.734	.652
Coca Cola	.200	.561
Colgate Palmolive	.460	.921
Continental Can	.830	.736
Diamond Shamrock	1.579	1.222
Easco	1.166	1.345
Emerson Electric	.306	1.095
Gardner Denver	1.649	.857
General Mining	1.400	.771
Homestake Mining	−.111	−.055
International Paper	1.082	.993
Kaiser Aluminum	1.079	1.012
Lt. Company	.708	.719
M. Lowenstein	3.592	1.189
Motorola	3.047	1.469
Nabisco	.216	.491
Pennwalt	.426	.723
Philip Morris	−.102	.858
PPG Industries	1.589	.848
Raybestos Manhattan	3.038	.654
Royal Dutch Petroleum	.409	.596
Skelly Oil	.611	.492
Standard Oil, California	.139	.449
Stauffer Chemical	.967	1.115
Warner Lambert	.580	1.234
Allegheny Power	.156	.458
Central Hudson Gas and Electric	.216	.313
Cincinnati Gas and Electric	1.721	.553
Columbus and Southern Ohio Electric	.180	.487
Commonwealth Edison	.180	.458
Consolidated Edison of New York	.132	.480
Duquesne Light	−.042	.390
Florida Power	−.331	.631
Illinois Power	.241	.413
Kansas Gas and Electric	.017	.515
Niagara Mohawk Power	−.025	.392
Northern States Power	.054	.281
Pennsylvania Power and Light	.231	.479
Philadelphia Electric	.099	.486
Public Services Company of Indiana	.262	.526
San Diego Gas and Electric	.839	.517
Southern California Edison	−.235	.497

Source: Gordon, M.J., and P.J. Helpern, "Cost of Capital for a Division of a Firm", Journal of Finance,(5),1975. p.1162.

Not all of the variation in the market variance is accounted for in the earnings betas. The earnings data for a company or set of companies may lead or lag earnings compared to other companies. However, the change in price of a company's shares during a period will eliminate most of the lead or lag by reacting to both the firm's current and expected earnings performance and the expected performance of all companies. In other words, the change in earnings is one piece of information about future earnings whereas the change in share price reflects all available information about future earnings.

The use of both NOI and NII betas captures the effect of risk from operations, financing, and consequently, changes in dividend yields and thus, reduces the error caused by depending upon a single measure of earnings to explain the systematic market risk of the company. Ideally, the strongest possible relationship between market and earnings risk measures is sought. In individual cases, other factors contributing to risk by the company under consideration would have to be introduced in the analyses in order to improve the estimates.

D. Market Return for the Non-traded Corporation

The market risk measure, $\hat{B}_p$ and intercept term $\hat{A}_p$ were measured for the set of firms in the same risk class as the non-traded firm in the previous section. Using these measures together with the realized return of the market portfolio, $R_{M,t}$, or the expected return if the result is to be a projection, the inferred market rate of return for the non-traded firm can be calculated by substituting the values which were previously obtained, $\hat{A}_p$, $\hat{B}_p$, $R_{M,t}$, into the following equation.

$$(11)\quad \hat{R}_{N,t} = \hat{A}_p + \hat{B}_p (R_{M,t})$$

$\hat{R}_{N,t}$ is the normal return on equity for the non-traded firm in period t.

Analytically, an evaluation should be made of the stability of $\hat{B}_p$ over various time periods. If $\hat{B}_p$ is not reasonably constant but indicates a trend for the firms in the same risk classas the non-traded firm, then a time related function of $\hat{B}_p$ should be used instead of a single measure of $\hat{B}$. In addition, some improvement in the regression estimates may be possible by introducing the industry factor,ie. using the market return to the industry of which the non-traded firm is a part in addition to the market return, $R_{M,t}$. This factor has been shown to account for approximately 10% ofthe variation in some industries and very little in other industries in other studies. The choice of including the industry returns is dependent upon the industry as to whether its returns differ substantially from that of the rest of the firms in the economy and whether its inclusion increases or decreases the strength of the relationship between the firm and market risk coefficients.

E. Dividend Returns

Non-traded firms, generally do not pay dividends to shareholders and when they do, the dividend policy bears no relationship to the policy which would be used by a traded firm, with shareholders. It is necessary to calculate the dividends which would be paid if the non-traded firm did trade. The common share dividend payout ratio of all firms in the same risk class as the non-traded firm is obtained as follows.

$$O_{j,t} = D_{j,t} / NIC_{j,t} \tag{12}$$

where;

$O_{j,t}$ = the dividend payout ratio of company j in period t

$D_{j,t}$ = the total dividends on common shares paid by company j in period t

$NIC_{j,t}$ = the net income available to common shareholders of company j in period t.

Using the same weights which were employed in finding the portfolio market returns of the traded firms previously, $w_{j,t}$, the dividend payout ratio for the n firms in the same risk class as the non-traded firm is measured in the following equation;

$$(13) \quad O_{p,t} = w_{1,t}\, O_{1,t} + \ldots\ldots + w_{n,t}\, O_{n,t}$$

where $O_{p,t}$ is the dividend payout ratio of the portfolio of firms. From these results, the estimated amount of dividends, $\hat{D}_{N,t}$, of the non-traded firm can be measured from the following.

$$(14) \quad \hat{D}_{N,t} = [\, O_{p,t} \,]\ [\, NIC_{N,t} \,]$$

Analysis of the payout ratios of the traded firms should reveal whether or not they are stable between firms and between periods of time. The existence of a trend factor, ie. towards higher or lower levels of dividends, would be accounted for by functionally relating the level of dividends of the traded firms to their levels of net income available to common shareholders.

From the estimated amount of dividends of the non-traded firm, $\hat{D}_{N,t}$, and the estimated market rate of return of the non-traded firm, $\hat{R}_{N,t}$, the market value of the equity is then calculated. The conventional notation for $\hat{R}_{N,t}$ is ke.

The growth rate model is used to calculate the estimated market value of the non-traded firm. The standard form of the growth rate model is as follows.

$$(15)\ P_{j,t} = d_{j,t}/[ke_{j,t} - g_j]$$

The variable, $d_{j,t}$, represents the dividends per share of company j in period, $P_{j,t}$ and $ke_{j,t}$ are previously defined and g_j is the growth rate. Multiplying equation (15) by the outstanding number of common shares yields the market equity value of the firm.

$$(16)\ \hat{E}_{N,t} = \hat{D}_{N,t}/[ke_{N,t} - g_{N,t}]$$

Since the necessity in this study is to determine the total market value of equity, $\hat{E}_{N,t}$, the outstanding number of shares do not have to be estimated. Total dividends, $\hat{D}_{N,t}$, enter the calculation and not dividends or price per share are required.

For other purposes, ie. the sales of individual shares on the financial markets, the current value of the share is calculated bydividing $\hat{E}_{N,t}$ by the appropriate number of shares. This is possible since the relationship between total equity and equity per share is linear. There are no economies of scale, only an equivalent dilution of share value by selling more shares.

F. Market Value of Debt

The book value of any firm's debt appears in it year end balance sheet. The value of the firm, however, is determined from market values and not book values. Since it is the market value of the firm which is to be maximized, it is necessary to convert the book value of debt to market value. The market rate of interest ,ki, on similar bonds, such as Aaa risk class, is used to calculate the market value of the firm's debt. The current market value is the present value of the amount of coupon interest ,i, on the face value of the debt, F, plus the present value of the debt repayment ,F, at maturity at time n. The market value of any debt obligation, b_t , at time t is as follows.

$$(17) \quad b_t = \frac{iF}{1 + ki} + \frac{iF}{(1 + ki)^2} + \ldots\ldots + \frac{F}{(1 + ki)^n}$$

This procedure is applied to each debt obligation. The sum of all the debt obligations is the market value of the firm's debt, $B_{j,t}$. There is no difference in the process of valuing debt for traded versus for traded versus non-traded firms, and consequently, the process of calculating the market value of debt at a point in time t for firm j is a common procedure.

G. Calculation of the Cost of Capital

The calculation of the Cost of Capital for the non-traded firm can now proceed. All necessary inputs to the have now been measured. These are;

$ki_{N,t}$ = the interest rate on the debt of the non-traded firm at time t,

$ke_{N,t}$ = the estimated required rate of return on equity of the non-traded firm at time t,

$B_{N,t}$ = the market value of equity of the non-traded firm at time t,

$E_{N,t}$ = the estimated market value of equity of the non-traded firm in time t.

The Cost of Capital of the non-traded firm is finally measured in the last equation.

$$(18)\ \text{Cost of Capital} = ki_{N,t} \frac{B_{N,t}}{B_{N,t} + E_{N,t}} + ke_{N,t} \frac{E_{N,t}}{B_{N,t} + E_{N,t}}$$

H. Other Considerations

Several additional points are worthy of note before applying the procedure to the cases of the non-traded Crown Corporations, Air Canada and Canadian National Railways.

(1) Measuring the value of a non-traded firm has its parallel in the financial literature with determining the market value, and cost of capital of a division of a traded firm. In that literature, the division does not trade on the financial markets but the total corporation does trade.[1] For example, the shares of General Motors Corporation trade on the New York Stock Exchange but those of the Chevrolet division do not. Two major approaches are possible. First, an attempt can be made to disaggregate the market return of the firm into divisional market returns. As there is no current market return for a public corporation, this approach is not possible here. The other approach is to treat the division as a separate entity and establish the market value and returns by relating the division to the market directly.

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[1] See, Gordon, M.J., and P.J. Helpern, "Cost of Capital For a Division of a Firm", *Journal of Finance*, 1974, Bower, R.S., and J.M. Jenks, "Divisional Screening Rates", *Financial Management*, Autumn, 1975, Jarrett, J.E., "Estimating The Cost of Capital For a Firm and the Allocation Problem in Accounting", *Journal of Business, Finance and Accounting*, Autumn, 1978, and Ezzamel, M.A., "Divisional Cost of Capital and the Measurement of Divisional Performance", *Journal of Business, Finance and Accounting*, 1971.

This is the approach which is followed in this study as the primary owner corporation, The Government of Canada, obviously also does not trade on the equity markets.

(2) The process of valuation is long and complex. While the method which was illustrated has rational and theoretical suppport, surrogates for the extended analysis may good approximations. For example, utilizing the book values directly of debt and equity may yield results which are within an acceptable range of error. Further, a simple capitalization of the projected earnings stream may generate a reasonable estimate of the market value. These possibilities represent empirical questions, individual to each case examined, as to whether the simplications yield the same results.

(3) Valuations are based upon the current capital structure. Significant changes in the capital structure have repurcussions for earnings, dividends, financial and operating risk, and the value of debt and equity. The previous discussion has emphasized that these elements are interrelated. Proposed changes in the capital structure will therefore, change all of the levels of the variables in the cost of capital calculation, and therefore, the final cost of capital.

(4) The valuation of a firm, whether traded or non-traded, is affected by expectations concerning its planned and unplanned changes in operations and financing. To the extent that such information affect the permanent earnings stream of the firm, such changes in expectations should be factored into the analyses.

For a traded firm, such information is automatically impounded into its security price valuation. For a non-traded firm, the critical variables require adjusting in order to reflect the change in risk and expected return.

(5) Finally, the process of valuing a non-traded firm is one of necessary inference which generates the maximum likelihood estimator of the cost of capital. The sensitivity of the measure and the expected error rate or confidence interval are supplementary data which are part of the inference process and essential information in its assessment.

In the next two chapters, the procedures which have been discussed in this chapter will be applied. The cases are Air Canada and Canadian National Railways. The equity of both of these Crown Corporations currently do not trade on the public security markets.

CHAPTER IX

ESTIMATING THE COST OF CAPITAL FOR CANADIAN NATIONAL

IX. ESTIMATING THE COST OF CAPITAL FOR CANADIAN NATIONAL RAILWAYS

A. Introduction

In the preceeding chapter, the methodology for estimating returns and risk of a non-traded corporation was presented. The purpose of the next two chapters is to apply the methodology to demonstration cases. In this chapter, Canadian National Railways is the subject of analysis, followed by Air Canada in the next chapter.

Both chapters follow the same methodology which will be adhered to as closely as possible. Because the analysis tends to be complex for the uninitiated, numerous tables and graphs have been added in order to demonstrate the results and improve understanding. In addition, some comparisons with the respective industries and summaries of market performance are provided in order to put the results of analyses into their appropriate economic context.

Prior to proceeding, it is important to reiterate that in relatively few pages, the analysis of two large, major corporations are presented. The emphasis in the discussion therefore, is on the major path through the analysis. Practically, many refinements can be made in order to provide estimates which may contain improved confidence rates. The numerical results are therefore, provided primarily as a methodological demonstration. Other use of the figures contained in these chapters are viewed as being entirely at the user's risk. The researchers regard the actual figures presented as base figures from which more detailed analyses for specific purposes, such as privatization of public enterprise, may fruitfully proceed. The figures should be considered as providing groundwork, and not final results. Further, these results should not be construed as an evaluation of the performance of either of the non-traded corporations. Their actual performances are used, but whether this performance is good, bad, or indifferent, requires comparisons with both internal and external measures of performance, and against the specific objectives of the corporation. Instead, actual performance is used in order to provide a methodological demonstration.

B. Income and Growth

Canadian National Railways regularly publishes its financial reports and consequently, its financial characteristics are widely available. In order to place the ensuing analysis into perspective, the historical financial summary, from 1927-1983, which was obtained from the Financial Post Databank,

EXHIBIT IX-1

CANADIAN NATIONAL RAILWAYS
FINANCIAL SUMMARY 1927-1982

HISTORICAL SUMMARY

(As originally stated in company's annual reports for the respective years)

Fiscal Year	Total Assets	Invest-ments	L.-term Debt*	CN Rail Revenue	CN Rail Net Inc.	Other Net Inc.	Interest Expense	Net Inc. Oper.
	$000's							
1927	2,158,918	44,694	981,382	256,675	34,704	6,635	72,639	d34,373
1928	2,213,292	58,785	977,689	276,632	48,289	5,644	73,538	d24,730
1929	2,3[illegible]3,879	51,589	1,122,559	259,879	34,707	7,535	77,323	d40,934
1930	2,344,691	29,468	1,168,566	221,770	19,378	8,727	50,921	d61,287
1931	2,374,093	30,396	1,276,457	200,505	d5,751	8,424	55,587	d84,263
1932	2,355,986	31,337	1,264,517	161,104	d519	7,348	56,965	d96,532
1933	2,358,013	34,585	1,255,302	148,520	d893	5,435	58,465	d98,052
1934	2,357,042	32,417	1,246,330	164,903	6,362	5,285	55,812	d85,501
1935	2,325,150	32,362	1,154,779	173,185	7,526	3,930	53,469	d84,828
1936	2,300,369	32,384	1,184,612	186,610	7,366	4,129	49,185	d79,826
1937	2,054,993	33,323	1,221,997	198,397	9,709	3,777	45,859	d42,029
1938	2,063,632	37,259	1,249,996	182,242	d1,907	4,251	49,539	d54,471
1939	2,076,262	39,456	1,263,401	203,820	12,438	5,728	50,731	d38,239
1940	2,088,217	39,332	1,199,816	247,527	35,564	6,172	53,439	d15,365
1941	2,112,153	38,429	1,134,394	304,377	55,627	5,925	50,345	4,018
1942	2,164,245	42,767	809,216	375,655	74,930	6,952	48,952	25,053
1943	2,236,740	39,882	744,232	440,618	81,639	9,915	49,553	35,639
1944	2,286,512	42,828	629,454	441,148	67,725	10,522	48,070	23,027
1945	2,303,355	42,329	573,180	433,773	67,878	7,521	45,325	24,758
1946	2,312,402	44,460	530,443	400,586	31,559	7,484	44,581	d8,962
1947	2,354,275	60,749	582,660	438,196	23,711	7,335	43,624	d15,695
1948	2,447,129	65,468	1,344,727	491,270	10,176	6,244	44,330	d33,533
1949	2,478,084	63,480	1,368,527	500,723	5,547	6,653	45,101	d42,043
1950	2,530,987	64,615	1,398,678	553,832	40,444	7,194	45,578	d3,261
1951	2,633,885	54,140	1,472,771	624,934	25,597	7,419	46,515	d15,032
1952	2,768,015	52,053	833,550	675,219	19,494	7,269	24,153	142
1953	2,917,980	55,478	931,952	696,622	20,157	9,510	28,057	244
1954	3,127,080	69,978	1,093,742	640,637	639	7,675	31,209	d28,758
1955	2,961,705	81,536	1,065,809	689,270	35,157	9,082	31,304	10,718
1956	2,953,039	68,744	1,173,235	774,901	46,792	12,513	30,259	26,077
1957	3,155,660	105,645	1,372,293	753,165	d2,048	10,055	35,615	d29,573
1958	3,370,868	135,613	1,518,600	704,947	d14,264	9,194	44,570	d51,591
1959	3,559,413	188,809	1,666,743	740,165	d1,687	10,612	51,225	d43,583
1960	3,661,652	264,025	1,828,330	693,141	d12,677	14,289	66,365	d67,497
1961	3,716,820	284,276	1,837,670	710,305	d11,842	17,522	70,535	d67,308
1962	3,754,121	294,765	1,842,348	701,623	d5,819	19,393	74,017	d48,919
1963	3,730,358	294,567	1,791,253	725,181	5,012	16,179	75,523	d43,014
1964	3,755,958	293,300	1,780,190	762,632	7,457	16,478	74,151	d38,726
1965	3,801,067	292,746	1,778,440	827,291	9,910	16,525	73,257	d33,415
1966	3,870,160	293,394	1,772,840	906,142	24,288	15,641	75,202	d24,563
1967	3,951,301	359,480	1,844,712	945,213	2,769	26,414	76,910	d35,869
1968	4,068,238	433,185	1,919,561	961,867	18,729	22,548	88,592	d29,177
1969	4,105,441	434,352	1,898,802	1,014,257	18,392	31,157	95,728	d24,646
1970	4,159,820	436,229	1,597,433	1,042,353	14,720	31,072	97,019	d29,709
1971	4,220,505	439,746	1,836,494	1,140,788	21,348	22,862	83,250	d24,269
1972	4,270,569	440,494	1,294,009	1,257,118	23,868	24,359	88,556	d17,622
1973	4,409,158	444,926	1,894,398	1,400,840	25,714	22,791	91,707	d21,324
1974	4,643,320	449,210	1,690,826	1,725,965	15,837	35,100	112,277	d37,733
1975	4,952,538	449,744	2,071,124	1,812,615	d91,289	34,114	133,451	d168,116
1976	4,398,051	416,755	2,238,381	1,731,000	157,100	d16,378	129,368	11,764
1977	4,663,221	415,553	2,376,253	1,872,800	199,434	d15,354	154,7[illegible]	16,804
1978	4,531,148	68,443	1,322,265	2,059,400	257,141	d24,459	95,154	82,133
1979	5,143,131	161,613	1,505,237	2,333,900	234,604	d23,150	98,359	113,204
1980	5,645,213	93,380	1,551,017	2,645,181	250,529	d55,553	110,925	103,922
1981	6,140,167	94,048	1,737,345	3,053,139	230,387	d35,237	170,831	102,030
1982	6,335,971	42,431	2,274,817	2,961,504	d34,899	d188,138	240,373	d223,035

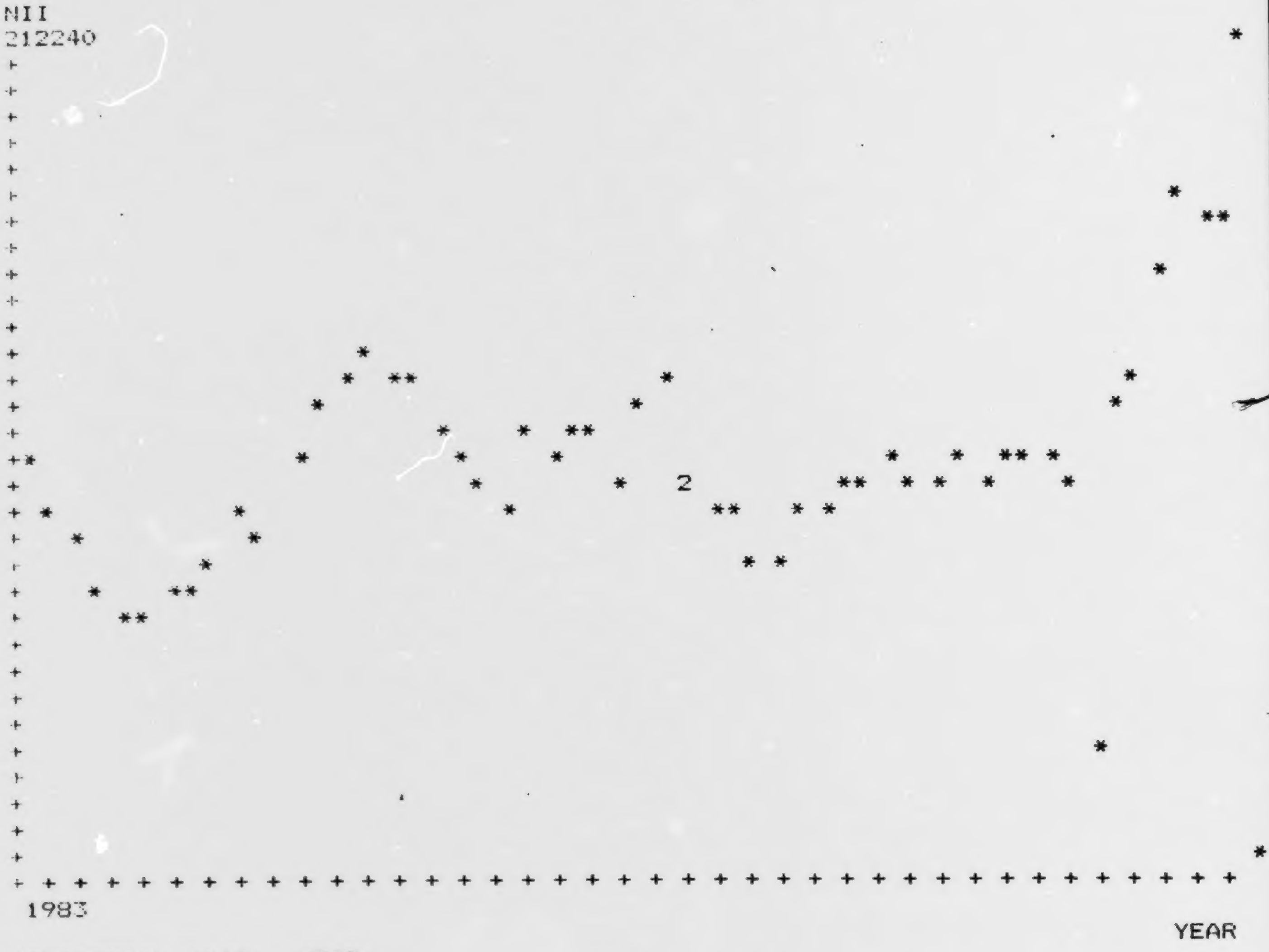
*Net amount in 1979 and previously.

appears in Exhibit IX-1.

Exhibit IX-1 is presented as background information. More detailed data were obtained in order to actually conduct the analysis. However, several major points become evident with only a cursory overview of this exhibit. Total assets have steadily increased over the period of the exhibit in column 1, as has CN Rail Revenue which appears in the fourth column. Over the same period, long term debt in column three and the associated interest expense in column 7 have not maintained a steady progression. This is particularly apparent during the period of the 1970's and 1980's in which there has been a substantial fluctuation in these accounts. The impact of the 1978 realignment of the financial structure clearly appears in the exhibit. Long term debt decreased from $2,376 million in 1977 to $1,322 million in 1978 but has since surpased the high of previous years. Interest expense from the change in financial structure follows a similar erratic pattern. From $154 million in 1977, it dropped to $95 million in 1979, but by 1982 is $240 million.

Another fact which is evident from Exhibit IX-1 is obtained from the eighth or last column, showing the Net Income stream. Of the fifty-six periods in the exhibit, in only fourteen was an

EXHIBIT IX-2
CANADIAN NATIONAL RAILWAYS
SCATTERGRAM
HISTORICAL INCOME SERIES



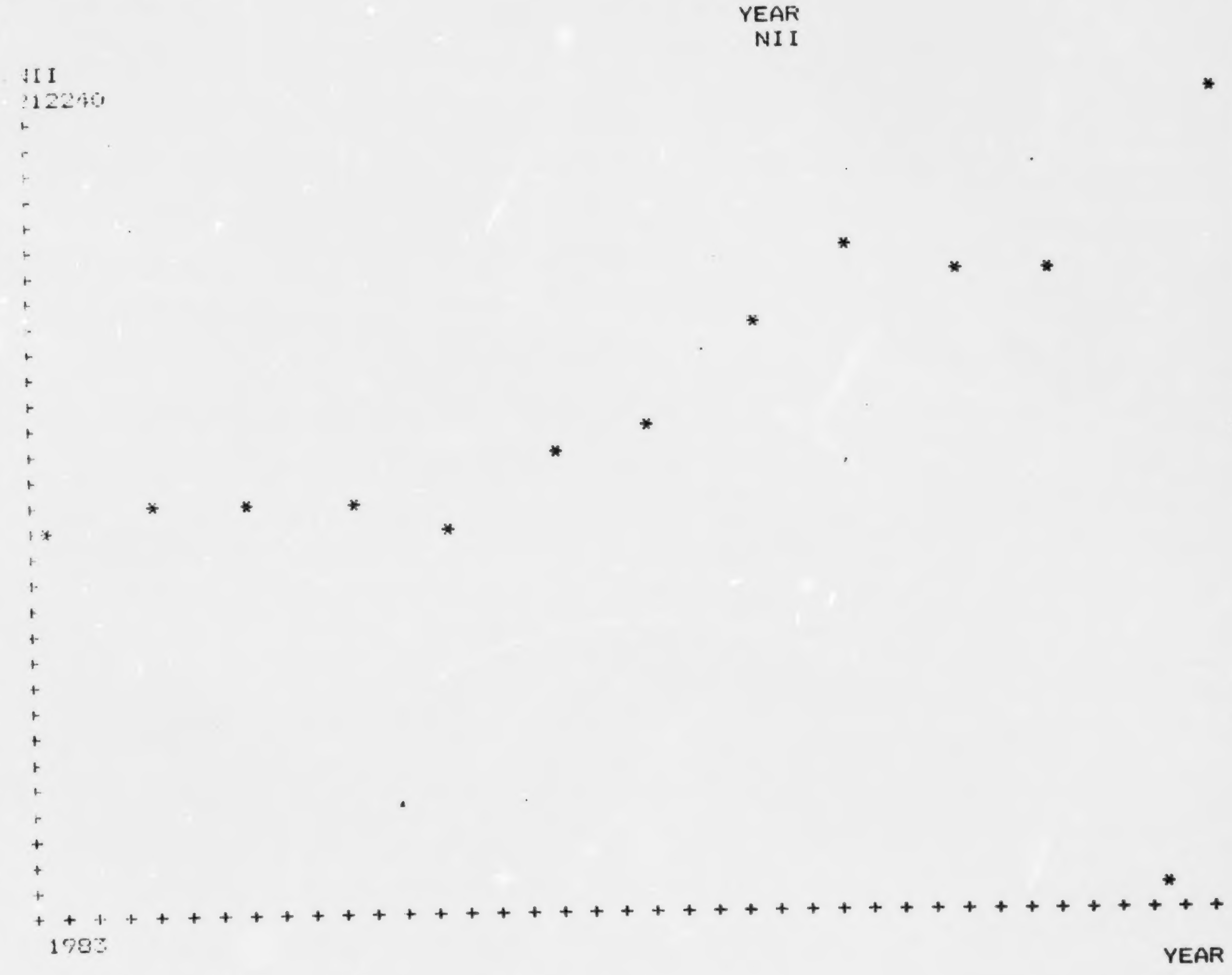
```
HORIZONTAL AXIS:  YEAR
 LEFT ENDPOINT:   1928       RIGHT ENDPOINT:  1983

VERTICAL AXIS:   NII
 LOWER ENDPOINT: -223035     UPPER ENDPOINT:  212240

HEADER DATA FOR: B:CNII      LABEL: CN NII
NUMBER OF CASES:  56         NUMBER OF VARIABLES:  2
```

EXHIBIT IX-3
CANADIAN NATIONAL RAILWAYS INCOME REGRESSION RESIDUALS

```
                                          STANDARDIZED RESIDUALS
   OBSERVED CALCULATED   RESIDUAL -2.0                 0                 2.0
 1 -34373.000 -20252.638 -14120.362 !                * !                  !
 2 -24730.000 -56323.051  31593.051 !                  !    *             !
 3 -40934.000 -55079.244  14145.244 !                  ! *                !
 4 -61287.000 -53835.437  -7451.563 !                 *!                  !
 5 -84263.000 -52591.629 -31671.371 !             *    !                  !
 6 -96532.000 -51347.822 -45184.178 !           *      !                  !
 7 -96052.000 -50104.015 -45947.985 !           *      !                  !
 8 -85501.000 -48860.207 -36640.793 !            *     !                  !
 9 -84828.000 -47616.400 -37211.600 !            *     !                  !
10 -79626.000 -46372.592 -33253.408 !             *    !                  !
11 -42029.000 -45128.785   3099.785 !                  *                  !
12 -54471.000 -43884.978 -10586.022 !                * !                  !
13 -15385.000 -41397.363  26012.363 !                  !   *              !
14   4016.000 -40153.556  44169.556 !                  !      *           !
15  25063.000 -38909.748  63972.748 !                  !         *        !
16  35639.000 -37665.941  73304.941 !                  !          *       !
17  23027.000 -36422.134  59449.134 !                  !        *         !
18  24756.000 -35178.326  59934.326 !                  !        *         !
19  -8962.000 -33934.519  24972.519 !                  !   *              !
20 -15885.000 -32690.711  16805.711 !                  !  *               !
21 -33533.000 -31446.904  -2086.096 !                  *                  !

22 -42043.000 -30203.097 -11839.903 !                * !                  !
23  -3621.000 -28959.289  25338.289 !                  !   *              !
24 -15032.000 -27715.482  12683.482 !                  ! *                !
25    142.000 -26471.675  26613.675 !                  !   *              !
26    244.000 -25227.867  25471.867 !                  !   *              !
27 -28758.000 -23984.060  -4773.940 !                 *!                  !
28  10718.000 -22740.252  33458.252 !                  !    *             !
29  26077.000 -21496.445  47573.445 !                  !      *           !
30 -29573.000 -20252.638  -9320.362 !                 *!                  !
31 -51591.000 -19008.830 -32582.170 !             *    !                  !
32 -43588.000 -17765.023 -25822.977 !              *   !                  !
33 -67497.000 -16521.216 -50975.784 !          *       !                  !
34 -67608.000 -15277.408 -52330.592 !          *       !                  !
35 -48919.000 -14033.601 -34885.399 !             *    !                  !
36 -43014.000 -12789.794 -30224.206 !             *    !                  !
37 -38726.000 -11545.986 -27180.014 !              *   !                  !
38 -33415.000 -10302.179 -23112.821 !              *   !                  !
39 -24593.000  -9058.371 -15534.629 !                * !                  !
40 -35869.000  -7814.564 -28054.436 !              *   !                  !
41 -29177.000  -6570.757 -22606.243 !              *   !                  !
42 -24646.000  -5326.949 -19319.051 !               *  !                  !

43 -29709.000  -4083.142 -25625.858 !              *   !                  !
44 -24208.000  -2839.335 -21368.665 !               *  !                  !
45 -17822.000  -1595.527 -16226.473 !               *  !                  !
46 -21324.000   -351.720 -20972.280 !               *  !                  !
47 -37733.000    892.087 -38625.087 !            *     !                  !
48-168116.000   2135.895-170251.895*<                  !                  !
49  11764.000   3379.702   8384.298 !                  !*                 !
50  16804.000   4623.510  12180.490 !                  !  *               !
51  82123.000   5867.317  76255.683 !                  !            *     !
52 113204.000   7111.124 106092.876 !                  !                 *!
53 103922.000   8354.932  95567.068 !                  !               *  !
54 102030.000   9598.739  92431.261 !                  !              *   !
55-223035.000  10842.546-233877.546*<                  !                  !
56 212240.000  12086.354 200153.646 !                  !                  >*
```

140

EXHIBIT IX-4
CANADIAN NATIONAL RAILWAYS
SCATTERGRAM OF RECENT INCOME



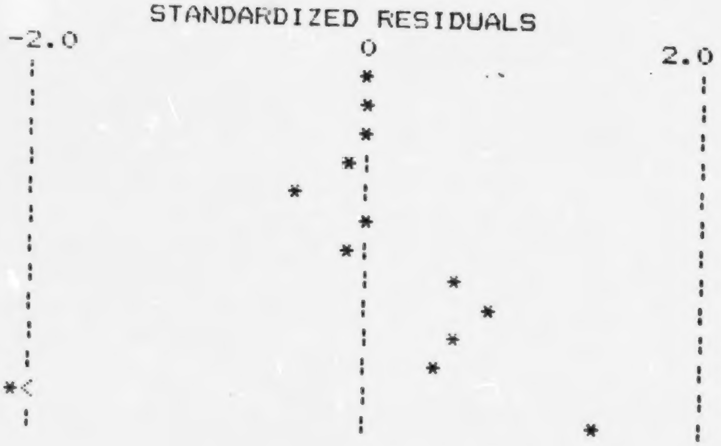
```
HORIZONTAL AXIS:  YEAR
 LEFT ENDPOINT:    1971        RIGHT ENDPOINT:  1983

VERTICAL AXIS:   NII
 LOWER ENDPOINT: -223035      UPPER ENDPOINT:  212240

HEADER DATA FOR: B:CNNII13    LABEL: A
NUMBER OF CASES:  13          NUMBER OF VARIABLES:  2
```

accounting profit generated. Nine of the fourteen profit years have occured within the past twelve years of the Exhibit.

In order to examine the income pattern further, the income figures were plotted in the scattergram which appears in Exhibit IX-2. Visual inspection verifies that the recent pattern of net income is not consistent with the cycle and trend observed in the past. The recent period contains wider variability and has a different trend. This result is emphasized in Exhibit IX-3 in which the regression residuals of net income around the long term trend line are plotted. The variability in later periods suggests that the long term results provide insufficient information regarding the near term income trend and variabilitiy.

Exhibit IX-4 contains the scattergram of the recent income experience of Canadian National Railways. In this scattergram, as in Exhibit IX-5 which shows the regression residuals for this data over the same time period, a different income pattern from the past emerges. For this reason, much of the ensuing analyses will focus on the recent history as a guide to future expectations regarding Canadian National Railways rather than the very long term, which is suspect in its repeatibility.

EXHIBIT IX-5
CANADIAN NATIONAL RAILWAYS
INCOME REGRESSION RESIDUALS



The first data requirement, and step in the methodology is to determine the Net Operating Income (NOI) figures for Canadian National Railways. Net Operating Income measures operating performance, before interest, taxes and other charges and thus, reflects the operating as opposed to the financial performance of the company.

Exhibit IX-6 contains a graph of the net operating income from 1962-1972, and Exhibit IX-7 for the period 1973-1983. Except for the year 1982, there has been a steady increase in these figures as the graphs would tend to suggest.

The growth rates of net operating income were obtained from these net operating income figures for each of the years. In order to examine this series of growth rates of Canadian National Railways, the growth rates for eleven other major railways were also obtained. The weighted average growth rate of the railway industry, primarily in the United States, and the growth rates for Canadian National Railways are contained in Exhibit IX-8. While the growth rates have tended to move together, it is evident that the variation of the Canadian National Railways growth rates is greater than the average for the industry.

In order to statistically examine the growth rates of net operating income, a regression analysis was performed between

EXHIBIT IX-6

NET OPERATING INCOME CANADIAN NATIONAL (1)

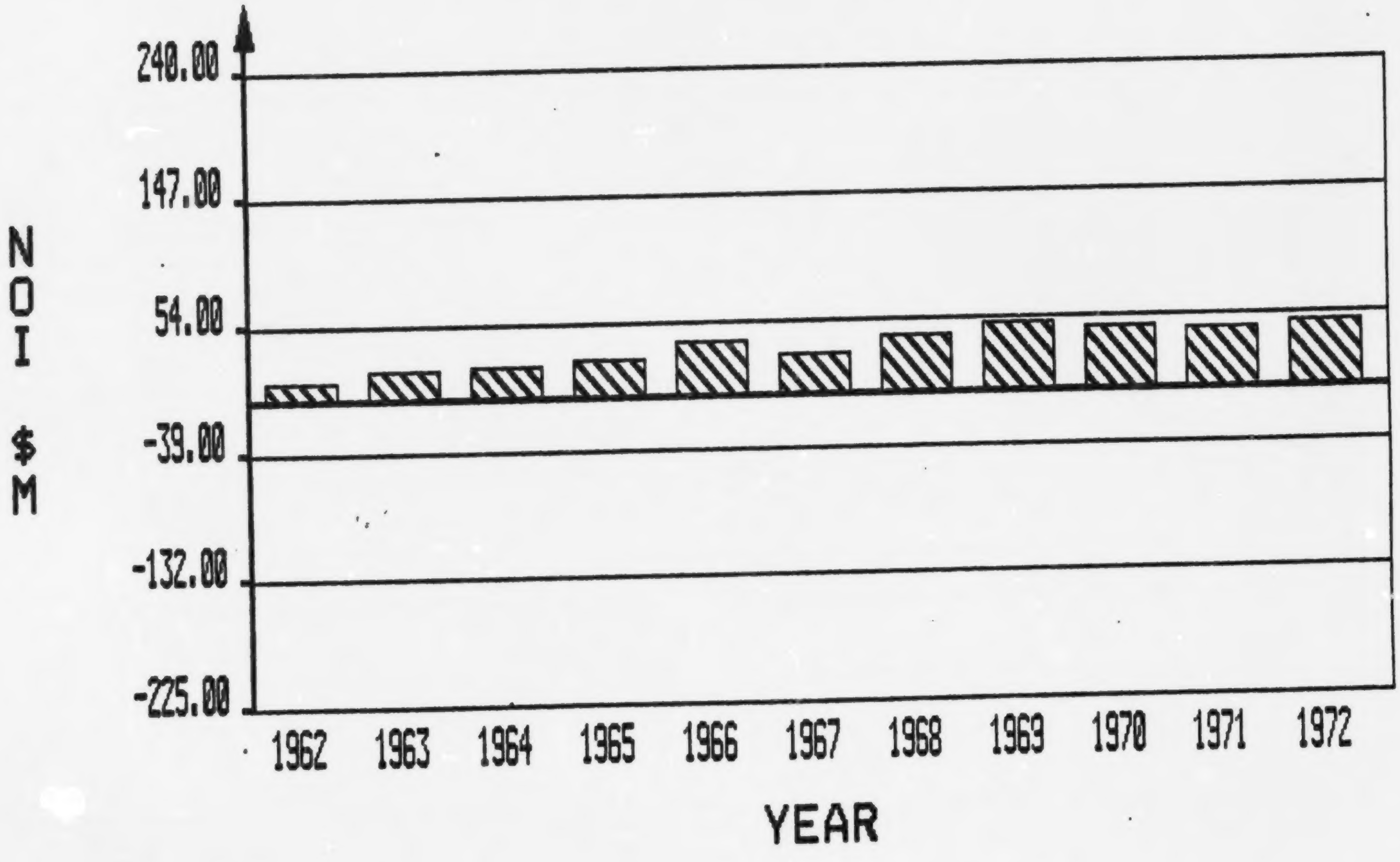


EXHIBIT IX-7

NET OPERATING INCOME CANADIAN NATIONAL (2)

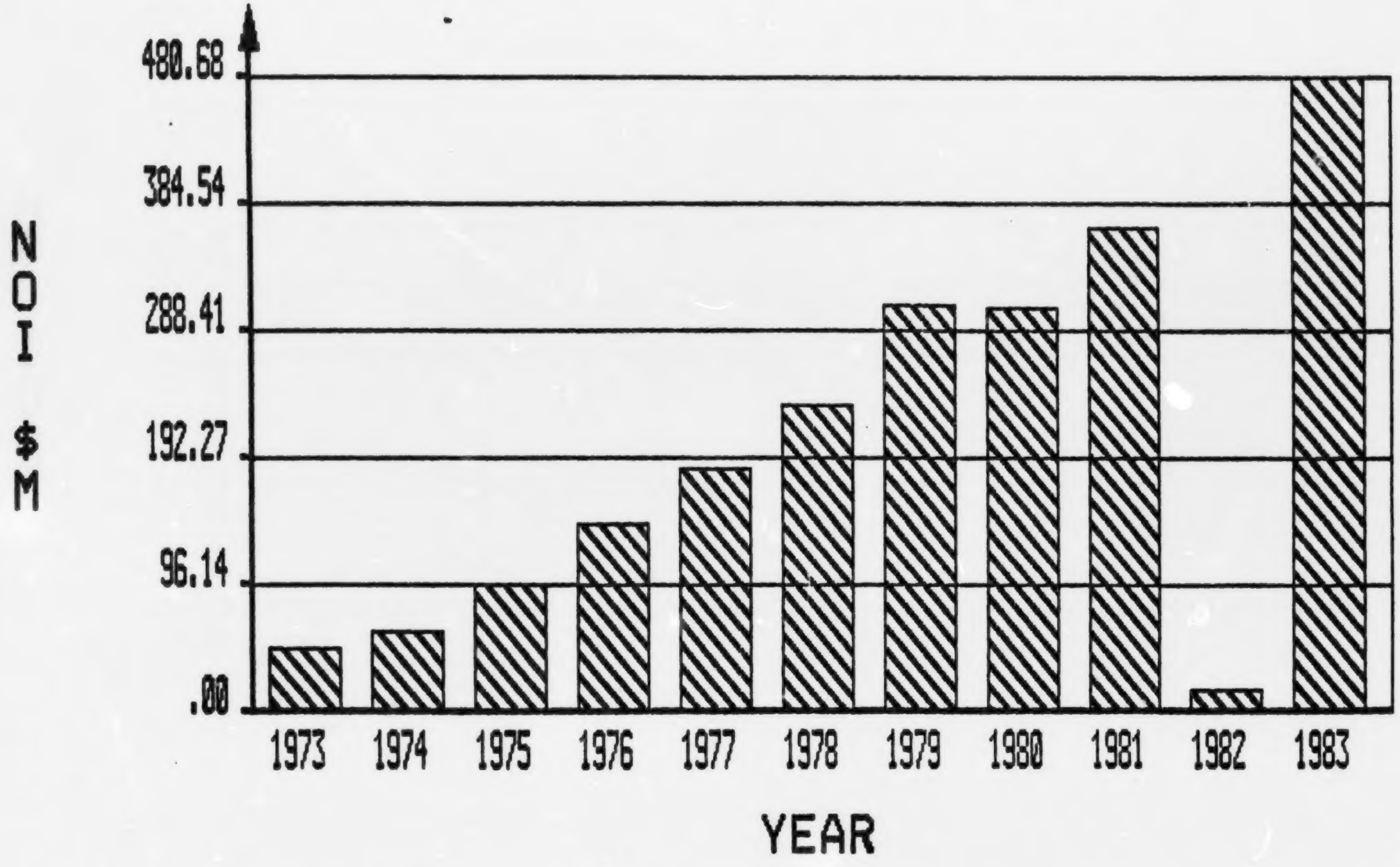
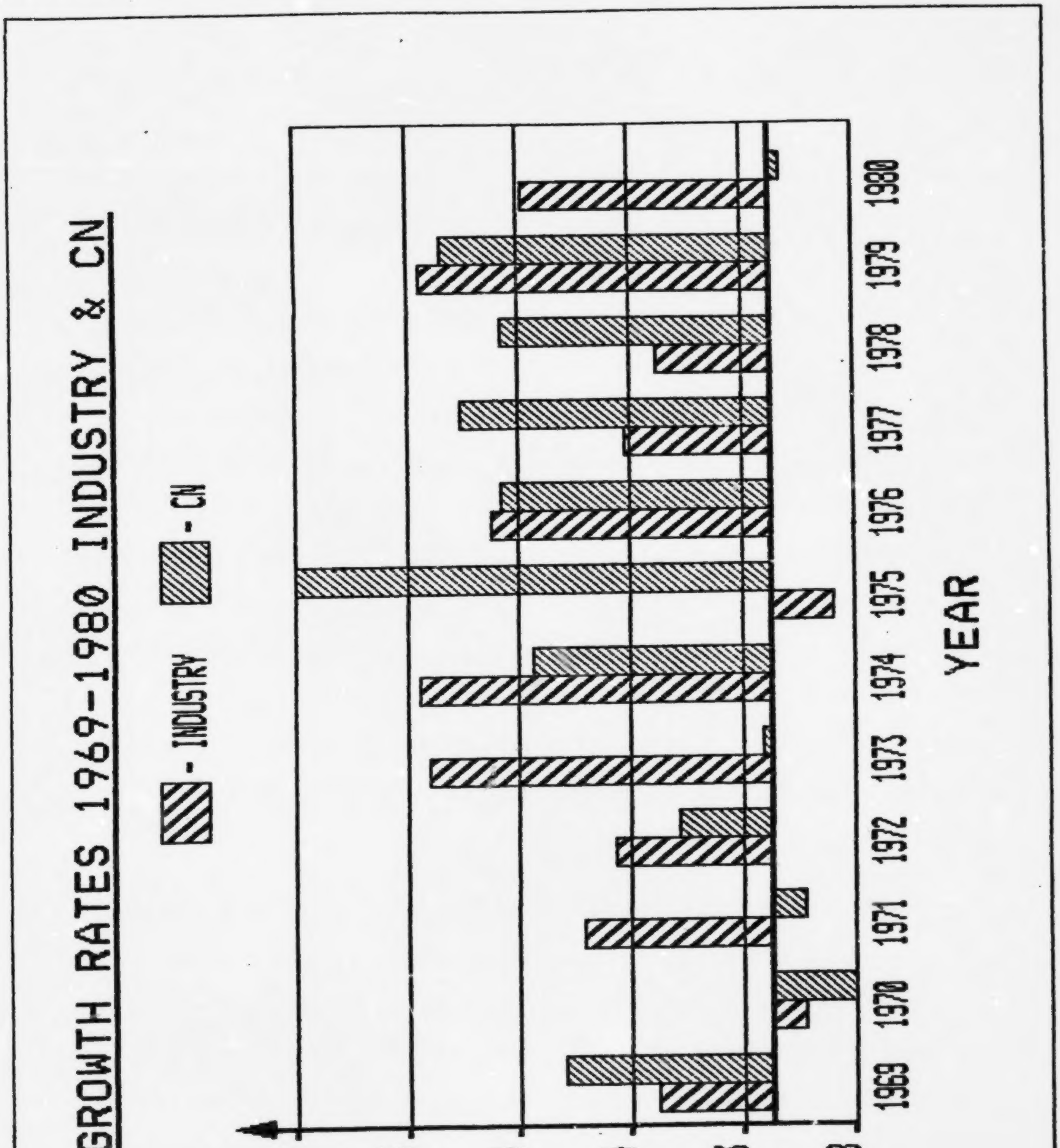


EXHIBIT IX-8


NOI GROWTH RATES 1969-1980 INDUSTRY & CN
▨ - INDUSTRY
▨ - CN
NOI GROWTH RATE
.46
.35
.24
.14
.03
-.08
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
YEAR

Canadian National and the industry growth rates. The average growth rate of Canadian National Railways is 16.9% and is 16.9% for the industry. The standard deviation however, is greater for Canadian National suggesting a greater operating risk than for the other firms in the industry. Also, in a time series regression the regression coefficient, Beta, of the time series growth rate of Canadian National is .0154 compared to .0062 when a similar analysis was performed on the industry figures. This suggests a small improvement of Canadian National over the industry growth rates over time. In addition, the plot of the residuals of the regression in Exhibit IX-9 for Canadian National and for the industry in Exhibit IX-10 suggests that there is no consistent pattern although there may be an implicit cycle since the residuals appear above and below the trend line for several successive periods. Variation around the trend line is however, essentially random from observing the size and number of residuals above and below the trend line.

The range of the growth rates of net operating income is between -9.0% and +46% for Canadian National, whereas the range for the railway industry has been between -6.3% and +34.1% for the same period as contained in Exhibit IX-11. This suggests that Canadian National growth rates have a greater variability than that for the the average firm in the railway industry.

EXHIBIT IX-9
CANADIAN NATIONAL RAILWAYS
GROWTH RATE REGRESSION RESIDUALS

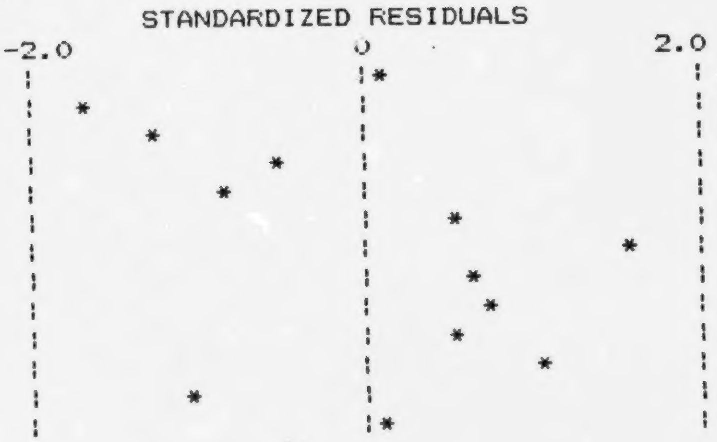


EXHIBIT IX-10
RAILWAY INDUSTRY
GROWTH RATE REGRESSION RESIDUALS

```
          STANDARDIZED RESIDUALS
   -2.0                0                2.0
    :                 *:                  :
    :      *           :                  :
    :                  :  *               :
    :                  :*                 :
    :                  :           *      :
    :                  :            *     :
    : *                :                  :
    :                  :      *           :
    :               *  :                  :
    :            *     :                  :
    :                  :          *       :
    :                  :  *               :
    :         *        :                  :
```

EXHIBIT IX-11

CANADIAN NATIONAL RAILWAYS

```
              -------- DESCRIPTIVE STATISTICS -------

HEADER DATA FOR: B:RICNGR      LABEL: GROWTH RATES
NUMBER OF CASES:  13           NUMBER OF VARIABLES:  3

                          LABEL: A

           VARIABLE NAME:     CN      N = 13
BEGINNING CASE NO. = 1 , ENDING CASE NO. = 13

           ARITHMETIC MEAN = .1692308

          SAMPLE STD. DEV. = .1611139
           SAMPLE VARIANCE = .0259577

      POPULATION STD. DEV. = .1547932
       POPULATION VARIANCE = 2.396095E-02

    STD. ERROR OF THE MEAN = 4.468496E-02

                   MINIMUM =-.08
                   MAXIMUM = .46
```

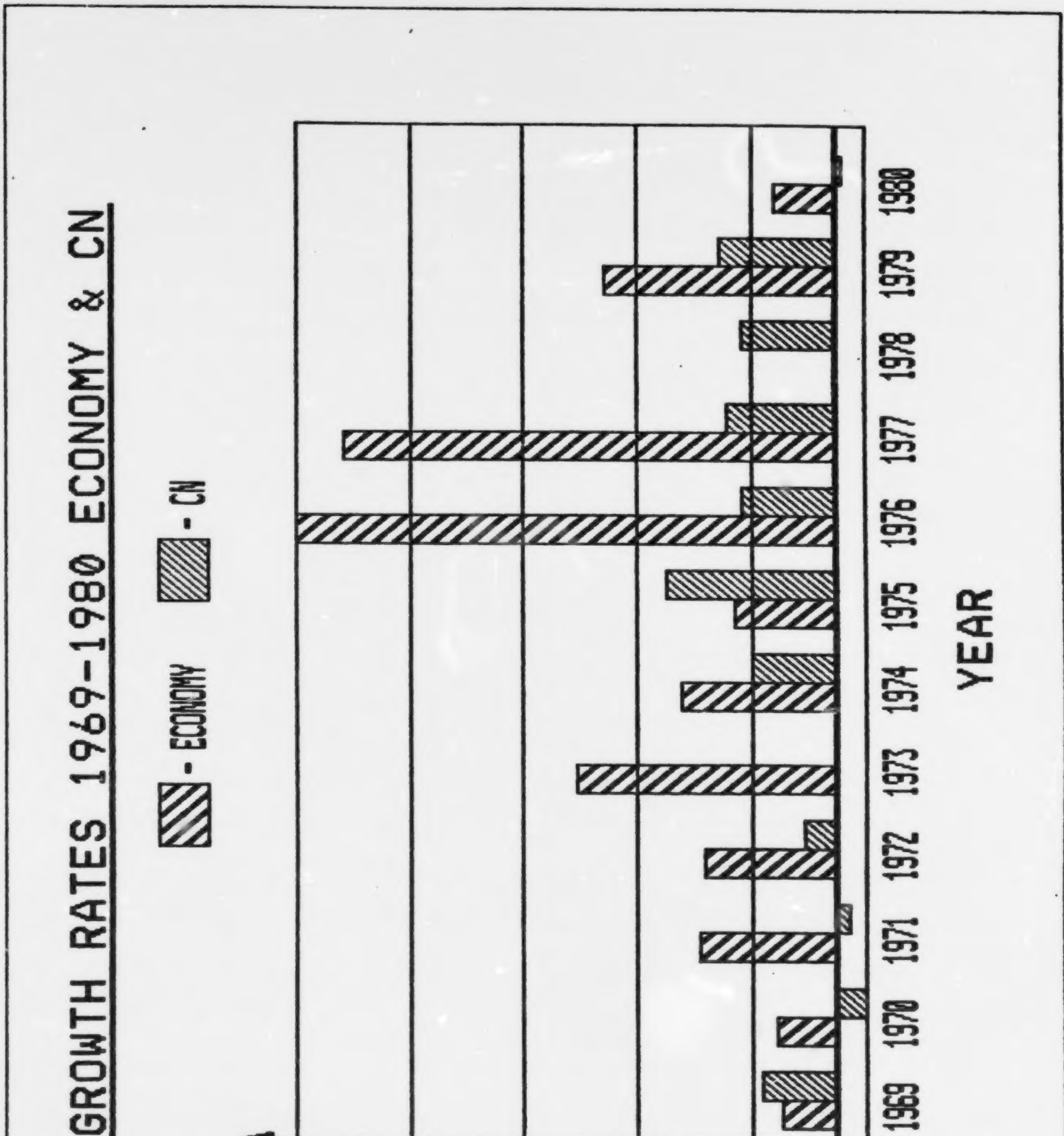
RAILWAY INDUSTRY

```
              ------- DESCRIPTIVE STATISTICS -------

HEADER DATA FOR: B:RICNGR      LABEL: GROWTH RATES
NUMBER OF CASES:  13           NUMBER OF VARIABLES:  3

                          LABEL: A

           VARIABLE NAME: RAILW      N = 13
BEGINNING CASE NO. = 1 , ENDING CASE NO. = 13

           ARITHMETIC MEAN = .1691769

          SAMPLE STD. DEV. = .1311223
           SAMPLE VARIANCE = 1.719305E-02

      POPULATION STD. DEV. = .1259782
       POPULATION VARIANCE = 1.587051E-02

    STD. ERROR OF THE MEAN = 3.636678E-02

                   MINIMUM =-.063
                   MAXIMUM = .3407
```

In order to place the study results in the Canadian context, the primary comparisons and evalauations are made against other Canadian firms. This is for three reasons. (1) The objective is to obtain competititive rates of return for public corporations in Canada. (2) When equity valuations are concerned, an investor is indifferent to the source of the investment return. (3) The market returns from the Canadian markets are necessary in later parts of the analyses. For this purpose, data were obtained on firms which are publicly traded and are listed on the Toronto Stock Exchange. The market returns from the Canadian markets are necessary in later parts of the analyses.

The analyses are constrained by the Canadian data requirement as well as the availability of data from these firms. This set of firms, approximately 250 initially, are used to calculate the net operating income growth rates of the firms in the Canadian economy. These growth rates are plotted, together with those of Canadian National Railways, for comparison in Exhibit IX-12. In most periods, the growth rates for the railroad are lower than that of the average firm which is privately owned and is market traded on the stock exhange in the Canadian ecomony.

EXHIBIT IX-12



Functionally, the primary importance of the growth rate figures is to determine the net operating income relationship of the non-traded firm, Canadian National Railways, with the traded Canadian firms. In order to obtain this relationship, the respective growth rates of Canadian National were regressed on the growth rates of the firms in the economy. The relationship which is generated is as follows in which, g, refers to the growth rates.

$$\text{(I)} \quad g^{NOI}_{CN} = .1321 + .0670\, g^{NOI}_{ECONOMY}$$

This functional relationship will subsequently be referred to as equation (I) and will be returned to at a later point in the analysis.

The other income figure which is used is net operating income after interest charges, NII. As opposed to the operating risk measured by NOI, the NII figures, by including interest charges measures the financial risk which results from the particular financial structure of the corporation. The NII figures which were obtained from Canadian National Railways appear in Exhibits IX-13 and IX-14 for the 1962-1972 and 1973-1983 periods. The impact of the interest payments is clearly shown in that for most of the periods, especially the early ones,

EXHIBIT IX-13

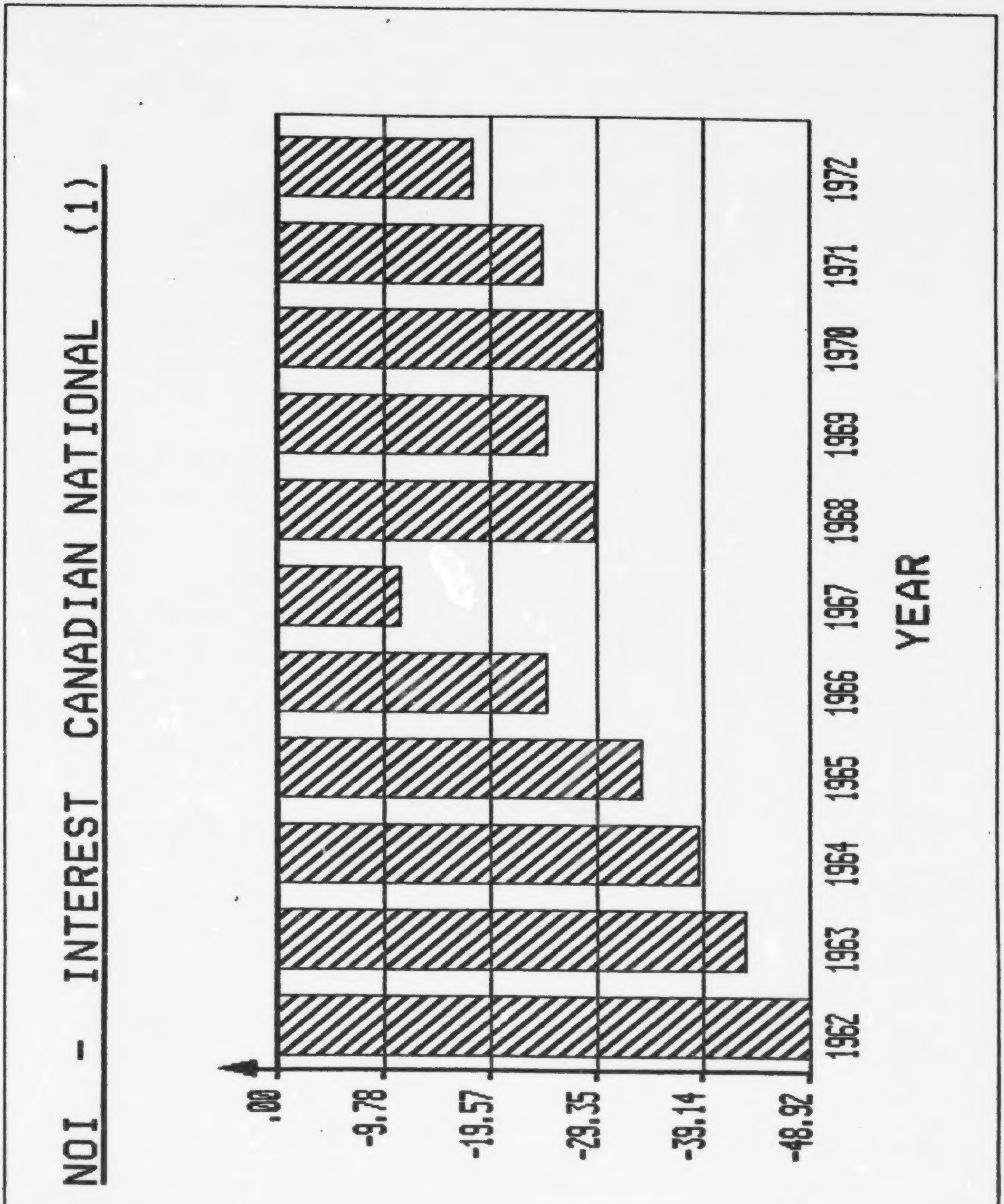
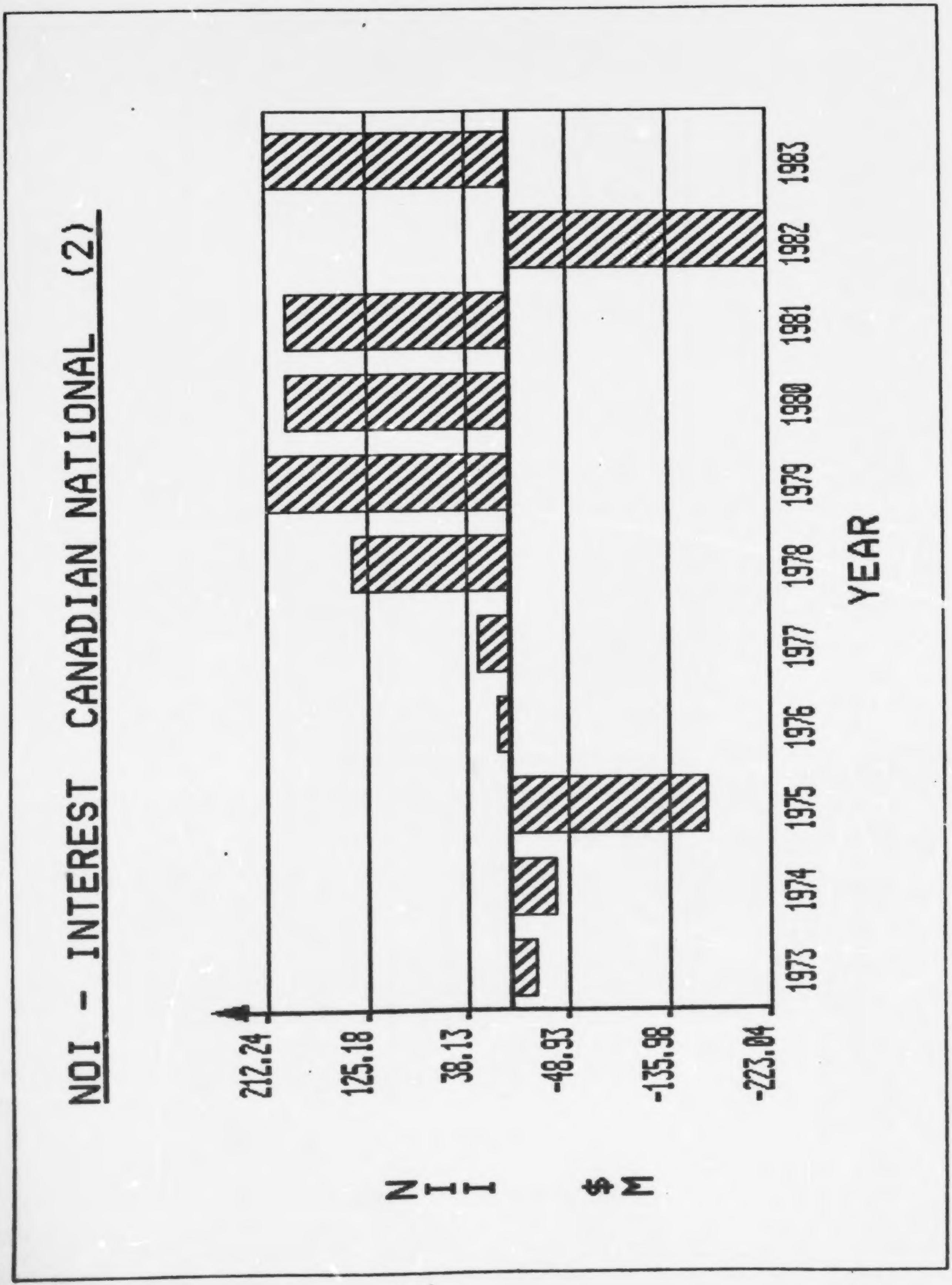


EXHIBIT IX-14

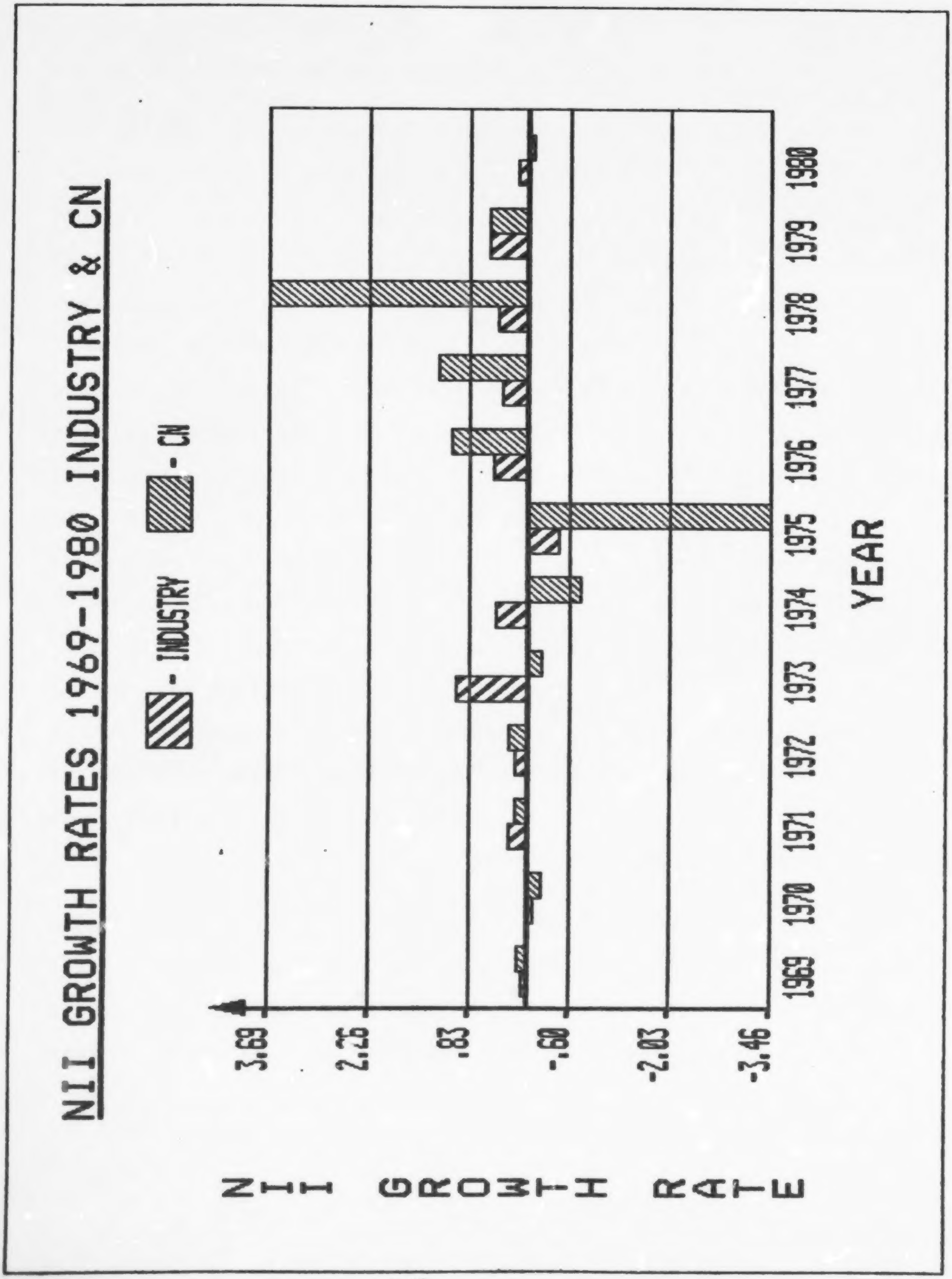


the resulting NII figures are consistently negative.

The growth rates of these figures were calculated and compared to the firms in the railway industry (United States) as in the previous analysis. The growth rates appear graphically in Exhibit IX-15 in which the primary differences between the series are apparent. While neither series exhibits a consistent growth pattern, the Canadian National figures exhibit a greater variation which is supported visually and statistically. The range for Canadian National is -3.46 to +3.69 whereas for the railway industry, the range is -.4625 to +1.109. In addition, the average growth rate for Canadian National's NII is 19% whereas the industry figure is 28% suggesting lower income and greater variability, and hence risk of income for Canadian National than the comparative industry performance. In addition, while the operating performance and risk of Canadian National is similar to other firms, the financial risk as contained in the NII growth figures suggest that the effects of financing and the financial structure tend to generate large inter-period deviations in income of the firm.

From the same group of publicly traded firms which were used to obtain the NOI growth figures in the Canadian economy, the NII growth rate figures were also obtained. The two series of growth rates, NOI and NII, for the Canadian economy firms appear

EXHIBIT IX-15



comparatively in Exhibit IX-16. The two series of growth rate figures for the Canadian firms tend to move in unison as the firms have adjusted their debt capacity during upswings and downswings of economic growth.

As in the previous NOI analysis, the growth rates of the NII figuresare regressed on the Canadian economy NII growth rates. The regression function which is obtained will be referred to as equation (II) and together with the previous equation from the NOI calculations, they appear below.

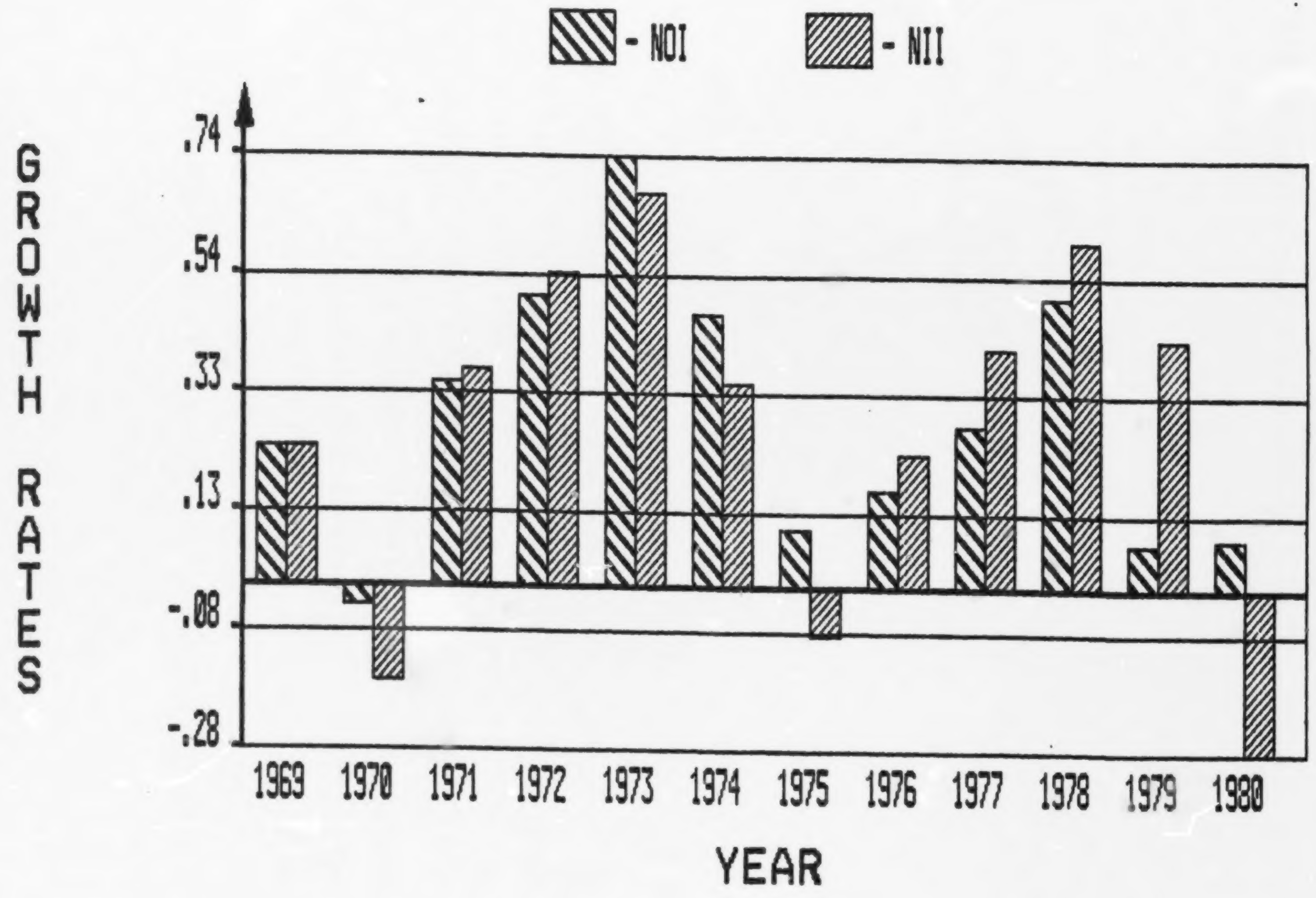
$$\text{(I)} \quad g_{CN}^{NOI} = .1321 + .0670 \; g_{ECONOMY}^{NOI}$$

$$\text{(II)} \quad g_{CN}^{NII} = -.4709 + 2.5418 \; g_{ECONOMY}^{NII}$$

This procedure is also applied to each of the market traded firms in the Canadian economy. That is, the NOI growth rates of each firm are regressed on the economy growth rates in order to obtain the functional relationship of each firm with the economy. Some firms were eliminated from the analyses due to incomplete data problems, mergers, bankruptcies, etc., leaving 156. The critical statistic is the Beta of the regression since it is the risk coefficient based upon income for each firm. The Beta coefficients of these regressions, ranked in decending order, for

EXHIBIT IX-16

CANADIAN GROWTH RATES 1969 - 1980



each firm, together with a list of the firms is contained in Exhibit IX-17. The coefficients range from +4.9506 to -4.2516.

The same procedure is applied to the NII growth rates of the same set of Canadian firms. The Betas which are obtained by regression analyses are for each firm within the Canadian economy. The list of NII Betas for each company appear in Exhibit IX-18 in decending order. The range of the Betas is from +4.3514 to -2.3299.

As these data are indicative of the Canadian economy, they will also be used for the purposes of examining Air Canada in the next chapter and consequently, will again be referred to as the need arises.

C. Portfolio Returns

In comparison to the firms in the Canadian economy, Canadian National Railways growth rate betas are low for NOI and comparatively high for NII indicating low operating but high financial risk. These betas were matched with the lists in Exhibits IX-17 and IX-18 in order to find a subset of firms which trade on the financial markets with the same risk characteristics as Canadian National Railways. Ten firms are obtained by this procedure and will subsequently be referred to as the portfolio

EXHIBIT IX-17

NET OPERATING INCOME REGRESSION COEFFICIENTS

SIGMA MINES (QUEBEC) LTD	4.9056
GIANT YELLOWKNIFE MINES LTD	4.6879
SPOONER MINES & OILS LTD	4.2578
CRESTBROOK FOREST INDS LTD	2.1097
BP CANADA INC	1.9471
NUMAC OIL & GAS LTD	1.7562
LA LUZ MINES LTD	1.7087
BRIT COLUMBIA FOREST PROD	1.7043
BRALORNE RESOURCES LTD	1.5762
ELECTROHOME LTD-CL Y	1.5530
GREAT PACIFIC INDUSTRIES INC	1.5452
MACMILLAN BLOEDEL LTD	1.5132
KERR ADDISON MINES LTD	1.4383
CONSUMERS DISTR LTD-CL A	1.4085
SHERRITT GORDON MINES	1.4034
HOWDEN (D.H.) & CO LTD	1.3689
PRINCIPAL NEO TECH INC	1.2831
DOMAN INDUSTRIES LTD-CL A	1.2478
DOME MINES LTD	1.1699
CROWN FOREST INDS LTD-CL A	0.9768
RIO ALGOM LTD	0.9069
REICHHOLD LTD	0.8933
BRAMALEA LTD	0.8781
BOW VALLEY INDUSTRIES LTD	0.8603
DOMTAR INC	0.8333
INDAL LTD	0.7972
MURPHY OIL CO LTD	0.7670
CANADIAN PACIFIC LTD	0.7585
TECK CORP-CL B	0.7243
CAMPBELL RED LAKE MINES	0.6722
STELCO INC-CL A	0.6622
HARVEY WOODS LTD	0.6565
DU PONT CANADA-CL A	0.6349
CONSOLIDATED BATHURST INC-A	0.5996
FRUEHAUF CANADA INC	0.5993
CRAIGMONT MINES LTD	0.5816
COMINCO LTD	0.5789
DRG INC-CL A	0.5747
CARA OPERATIONS LTD	0.5734
IPSCO INC	0.5647
MAGNA INTERNATIONAL INC-CL A	0.5509
WESTBURNE INTL INDS LTD	0.5412
CANADA TUNGSTEN MINING CORP	0.5317
SILCORP LTD-CL A	0.5294
STUART (D.A.) OIL CO LTD	0.5135
DENISON MINES LTD-CL A	0.5120
CAE INDUSTRIES LTD	0.4934

NET OPERATING INCOME REGRESSION COEFFICIENTS

PROVIGO INC	0.4227
ALCAN ALUMINIUM LTD	0.4068
GENSTAR CORP	0.4012
ALGOMA CENTRAL RAILWAY	0.3994
GREAT LAKES FOREST PRODS LTD	0.3918
INDUSMIN LTD	0.3847
HARDEE FARMS INTL LTD	0.3765
NORANDA INC	0.3681
PENNINGTONS STORES LTD	0.3596
INCO LTD	0.3485
WOODWARD LTD-CL A	0.3415
SLATER STEEL CORP	0.3238
WESTCOAST TRANSMISSION LTD	0.3129
ABITIBI PRICE INC	0.3085
HAWKER SIDDELEY CANADA	0.3041
SEARS CDA INC	0.2969
GALTACO INC	0.2744
SELKIRK COMMUNICATIONS LTD-A	0.2417
PINE POINT MINES LTD	0.2385
DONOHUE INC	0.2366
HERITAGE GROUP INC-CL A	0.2296
MONENCO LTD-CL A	0.2258
CANRON INC-CL A	0.2193
IMPERIAL OIL LTD-CL A	0.1996
INTERPROVINCIAL PIPE LINE	0.1984
CASSIDYS LTD	0.1922
MOLSON COS LTD-CL A	0.1684
HUDSONS BAY CO	0.1592
CANADA PACKERS INC	0.1530
SHELL CANADA LTD-CL A	0.1439
FCA INTERNATIONAL LTD	0.1327
BARBECON INC-CL A	0.1287
WESTON (GEORGE) LTD	0.1222
PRAIRIE OIL ROYALTIES CO LTD	0.1214
FINNING TRACTOR & EQUIP-CL B	0.1189
CONSOLTEX CANADA INC	0.1101
PANCANADIAN PETROLEUM LTD	0.0916
LAKE ONTARIO CEMENT LTD	0.0868
NEW BRUNSWICK TELEPHONE CO	0.0824
REITMAN'S (CANADA) LTD-CL A	0.0760
B C SUGAR REFINERY-CL A	0.0752
MARITIME TEL & TEL CO LTD	0.0692
TRANS MOUNTAIN PIPE LINE	0.0641
HUSKY OIL LTD	0.0592
ISLAND TELEPHONE CO LTD	0.0551
GULF CANADA LTD	0.0384

NET OPERATING INCOME REGRESSION COEFFICIENTS

HAYES-DANA INC	0.0369
OSHAWA GROUP LTD-CL A	0.0332
MOORE CORP LTD	0.0303
DOFASCO INC-CL A	0.0117
QUEBEC-TELEPHONE	0.0062
SOUTHAM INC	0.0013
ST LAWRENCE CEMENT INC-CL A	-0.0002
STEINBERG INC-CL A	-0.0223
BRIT COLUMBIA TELEPHONE CO	-0.0253
EMCO LTD	-0.0321
CANADA CEMENT LAFARGE	-0.0436
DAON DEVELOPMENT CORP	-0.0639
CANBRA FOODS LTD	-0.0693
BELL CANADA ENTERPRISES	-0.0709
SEAGRAM CO LTD	-0.0710
THOMSON NEWSPAPERS-CL A	-0.0813
NOVA-AN ALBERTA CORP-CL A	-0.0971
GREYHOUND LINES OF CAN LTD	-0.1000
ROTHMANS OF PALL MALL-CDA	-0.1060
DOVER INDUSTRIES LTD	-0.1176
WALKER (HIRAM) RESOURCES LTD	-0.1335
ATCO LTD-CL 1	-0.1644
REDPATH INDUSTRIES LTD	-0.1667
SCOTT PAPER LTD	-0.1725
NORTH CANADIAN OILS LTD	-0.1838
BRITISH AMER BANK NOTE INC	-0.1883
CANADIAN GENL ELEC CO LTD	-0.2009
TRANSCANADA PIPELINES LTD	-0.2019
PHOTO ENGRAVERS & ELECTROTYP	-0.2226
TRIZEC CORP LTD-CL B	-0.2239
CANADIAN TIRE CORP LTD-CL A	-0.2303
DOME PETROLEUM LTD	-0.2304
CANADIAN MARCONI CO	-0.2327
CANADIAN CORPORATE MGT-CL Y	-0.2636
FORD MOTOR CO OF CANADA LTD	-0.2676
IMASCO LTD	-0.2683
PEMBINA RESOURCES LTD	-0.2839
UNION CARBIDE CANADA LTD	-0.2899
C-I-L INC	-0.2924
LABATT (JOHN) LTD	-0.3289
GSW INC-CL B	-0.3303
FEDERAL PIONEER LTD	-0.3612
VULCAN INDL PACKAGING LTD	-0.3614
KELLY DOUGLAS & CO LTD-CL A	-0.3722
CANADA MALTING CO LTD	-0.3770
CONSUMERS GLASS CO LTD	-0.4617
TRADERS GROUP LTD-CL A	-0.4829
CRAIN (R.L.) INC	-0.4888

NET OPERATING INCOME REGRESSION COEFFICIENTS

SHAW INDUSTRIES LTD	-0.5866
MITCHELL (ROBERT)-CL B	-0.6564
CORBY (H.) DISTILLERY-CL A	-0.6677
WESTINGHOUSE CANADA INC	-0.7274
MACLEAN HUNTER-CL X	-0.7627
YELLOWKNIFE BEAR RESOURCES	-0.8905
RONYX LTD	-0.9229
GOODYEAR CANADA INC	-0.9754
CAMPBELL RESOURCES INC NEW	-1.0333
GESCO INDUSTRIES INC	-1.0790
LOBLAW COS LTD	-1.4021
PHILLIPS CABLES LTD	-1.5203
BRINCO LTD	-1.5297
SOBEYS STORES-CL A	-1.5400
COLOR YOUR WORLD INC	-2.0381
UNITED CANSO OIL & GAS LTD	-4.2518

EXHIBIT IX-18

NET INTEREST INCOME REGRESSION COEFFICIENTS

NUMAC OIL & GAS LTD	4.3514
SPOONER MINES & OILS LTD	2.8774
GIANT YELLOWKNIFE MINES LTD	2.7152
BRAMALEA LTD	2.4467
SIGMA MINES (QUEBEC) LTD	2.4193
GREAT PACIFIC INDUSTRIES INC	2.4104
BRIT COLUMBIA FOREST PROD	2.3768
DOMAN INDUSTRIES LTD-CL A	2.1807
DAON DEVELOPMENT CORP	2.0370
CONSOLIDATED BATHURST INC-A	1.9818
SLATER STEEL CORP	1.7743
CONSUMERS DISTR LTD-CL A	1.7346
HOWDEN (D.H.) & CO LTD	1.7328
MACMILLAN BLOEDEL LTD	1.6264
CRESTBROOK FOREST INDS LTD	1.5225
PRINCIPAL NEO TECH INC	1.4610
HUDSONS BAY CO	1.4083
SHERRITT GORDON MINES	1.2845
DU PONT CANADA-CL A	1.1816
OSHAWA GROUP LTD-CL A	1.1711
BOW VALLEY INDUSTRIES LTD	1.1360
SILCORP LTD-CL A	1.1167
REICHHOLD LTD	1.0716
BP CANADA INC	1.0713
SEAGRAM CO LTD	0.9985
MURPHY OIL CO LTD	0.9374
HARVEY WOODS LTD	0.9252
GALTACO INC	0.8876
DOMTAR INC	0.8624
CROWN FOREST INDS LTD-CL A	0.8444
CANADA TUNGSTEN MINING CORP	0.7762
PEMBINA RESOURCES LTD	0.7635
MAGNA INTERNATIONAL INC-CL A	0.7319
CONSOLTEX CANADA INC	0.7306
KERR ADDISON MINES LTD	0.6889
INDAL LTD	0.6758
LA LUZ MINES LTD	0.6582
DOME PETROLEUM LTD	0.6292
WESTCOAST TRANSMISSION LTD	0.5806
ALCAN ALUMINIUM LTD	0.5805
FINNING TRACTOR & EQUIP-CL B	0.5785
STELCO INC-CL A	0.5647
SEARS CDA INC	0.5455
DENISON MINES LTD-CL A	0.5286
WESTBURNE INTL INDS LTD	0.5234
GENSTAR CORP	0.5145
ALGOMA CENTRAL RAILWAY	0.5123
HAWKER SIDDELEY CANADA	0.5089

NET INTEREST INCOME REGRESSION COEFFICIENTS

SELKIRK COMMUNICATIONS LTD-A	0.4983
INDUSMIN LTD	0.4905
CANADIAN PACIFIC LTD	0.4890
PROVIGO INC	0.4620
DOME MINES LTD	0.4563
STUART (D.A.) OIL CO LTD	0.4531
CANADIAN MARCONI CO	0.4487
TECK CORP-CL B	0.4409
CARA OPERATIONS LTD	0.4408
CRAIGMONT MINES LTD	0.4303
NORANDA INC	0.4295
FRUEHAUF CANADA INC	0.4294
CAE INDUSTRIES LTD	0.4188
ABITIBI PRICE INC	0.4123
COMINCO LTD	0.4094
TRADERS GROUP LTD-CL A	0.3999
HERITAGE GROUP INC-CL A	0.3790
HUSKY OIL LTD	0.3752
BRALORNE RESOURCES LTD	0.3623
RIO ALGOM LTD	0.3560
CANBRA FOODS LTD	0.3067
COLOR YOUR WORLD INC	0.2967
CASSIDYS LTD	0.2905
WOODWARD LTD-CL A	0.2863
LAKE ONTARIO CEMENT LTD	0.2740
BARBECON INC-CL A	0.2653
IPSCO INC	0.2625
DONOHUE INC	0.2410
GOODYEAR CANADA INC	0.2204
NOVA-AN ALBERTA CORP-CL A	0.2081
CAMPBELL RED LAKE MINES	0.2081
CANRON INC-CL A	0.2015
PENNINGTONS STORES LTD	0.1865
GREAT LAKES FOREST PRODS LTD	0.1838
INTERPROVINCIAL PIPE LINE	0.1788
HAYES-DANA INC	0.1781
ISLAND TELEPHONE CO LTD	0.1576
WESTON (GEORGE) LTD	0.1468
MARITIME TEL & TEL CO LTD	0.1451
PRAIRIE OIL ROYALTIES CO LTD	0.1444
STEINBERG INC-CL A	0.1410
NEW BRUNSWICK TELEPHONE CO	0.1404
ROTHMANS OF PALL MALL-CDA	0.1386
CANADA MALTING CO LTD	0.1321
MOLSON COS LTD-CL A	0.1282
IMPERIAL OIL LTD-CL A	0.1175
SHELL CANADA LTD-CL A	0.1125
INCO LTD	0.0984

NET INTEREST INCOME REGRESSION COEFFICIENTS

TRANSCANADA PIPELINES LTD	0.0970
VULCAN INDL PACKAGING LTD	0.0968
PINE POINT MINES LTD	0.0917
EMCO LTD	0.0872
DRG INC-CL A	0.0803
TRANS MOUNTAIN PIPE LINE	0.0795
MONENCO LTD-CL A	0.0718
CANADA CEMENT LAFARGE	0.0679
WALKER (HIRAM) RESOURCES LTD	0.0568
REITMAN'S (CANADA) LTD-CL A	0.0558
BRIT COLUMBIA TELEPHONE CO	0.0352
QUEBEC-TELEPHONE	0.0289
CANADA PACKERS INC	0.0285
SOUTHAM INC	0.0143
PANCANADIAN PETROLEUM LTD	0.0123
FCA INTERNATIONAL LTD	0.0084
DOVER INDUSTRIES LTD	0.0050
MOORE CORP LTD	0.0009
PHOTO ENGRAVERS & ELECTROTYP	-0.0069
GULF CANADA LTD	-0.0147
THOMSON NEWSPAPERS-CL A	-0.0336
GREYHOUND LINES OF CAN LTD	-0.0400
BRITISH AMER BANK NOTE INC	-0.0735
DOFASCO INC-CL A	-0.0747
CANADIAN GENL ELEC CO LTD	-0.0903
CANADIAN CORPORATE MGT-CL Y	-0.0999
FORD MOTOR CO OF CANADA LTD	-0.1082
BELL CANADA ENTERPRISES	-0.1145
NORTH CANADIAN OILS LTD	-0.1355
REDPATH INDUSTRIES LTD	-0.1434
CANADIAN TIRE CORP LTD-CL A	-0.1600
CONSUMERS GLASS CO LTD	-0.1709
YELLOWKNIFE BEAR RESOURCES	-0.1760
KELLY DOUGLAS & CO LTD-CL A	-0.1770
WESTINGHOUSE CANADA INC	-0.1826
IMASCO LTD	-0.1874
SCOTT PAPER LTD	-0.1928
UNION CARBIDE CANADA LTD	-0.1955
B C SUGAR REFINERY-CL A	-0.1978
ELECTROHOME LTD-CL Y	-0.2022
C-I-L INC	-0.2332
LABATT (JOHN) LTD	-0.2934
CRAIN (R.L.) INC	-0.3466
MITCHELL (ROBERT)-CL B	-0.3627
GESCO INDUSTRIES INC	-0.3639
BRINCO LTD	-0.3651
CORBY (H.) DISTILLERY-CL A	-0.3821
SHAW INDUSTRIES LTD	-0.3906

NET INTEREST INCOME REGRESSION COEFFICIENTS

MACLEAN HUNTER-CL X	-0.4113
GSW INC-CL B	-0.4403
ATCO LTD-CL 1	-0.5495
ST LAWRENCE CEMENT INC-CL A	-0.5532
TRIZEC CORP LTD-CL B	-0.5535
FEDERAL PIONEER LTD	-0.6034
LOBLAW COS LTD	-0.6298
CAMPBELL RESOURCES INC NEW	-0.6367
PHILLIPS CABLES LTD	-0.7741
SOBEYS STORES-CL A	-1.0506
HARDEE FARMS INTL LTD	-1.1680
RONYX LTD	-2.0248
UNITED CANSO OIL & GAS LTD	-2.3299

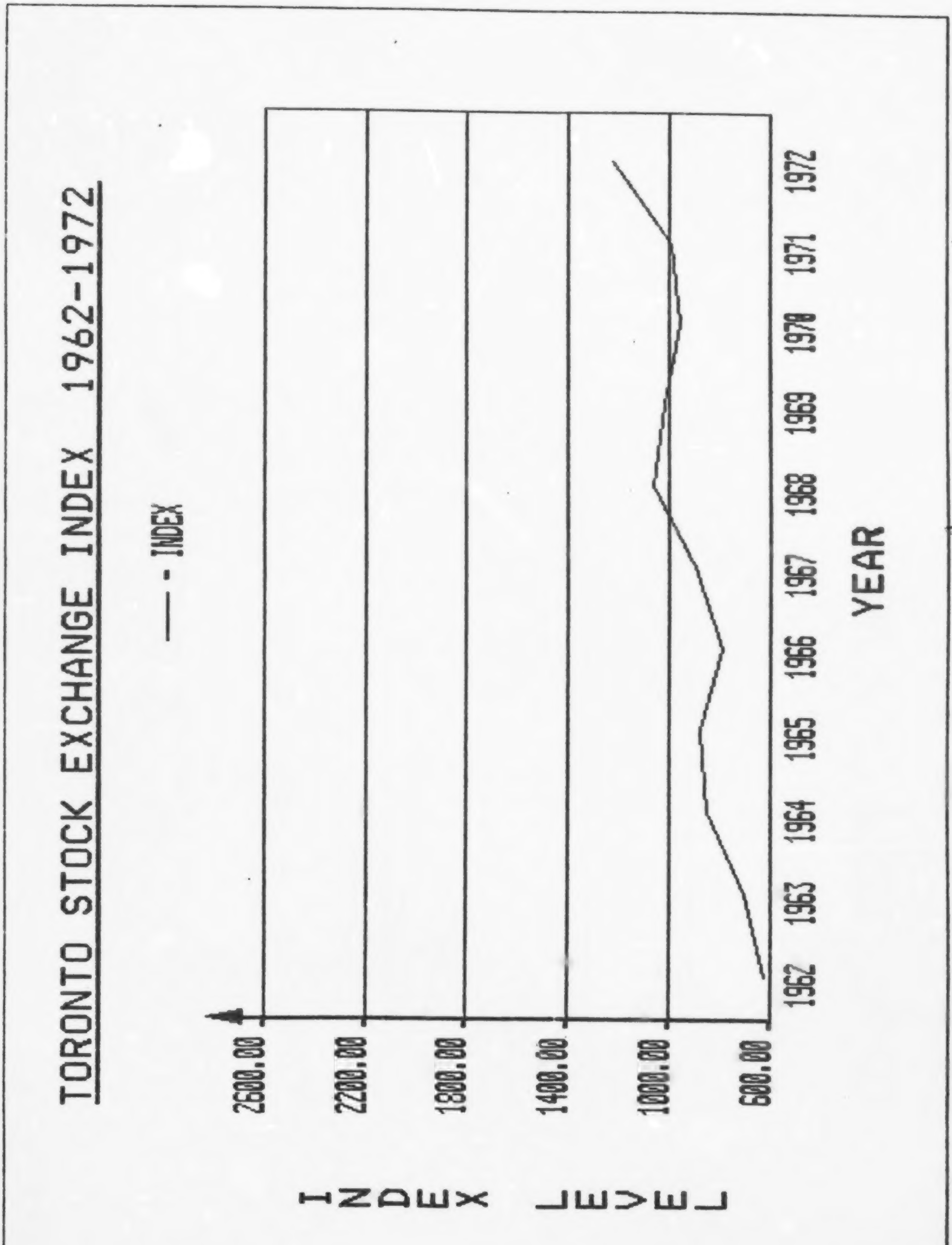
of market traded firms. It is this reduced set of traded firms in the portfolio which have the same risk characteristics as Canadian National Railways. This portfolio is the subject of the remaining analysis.

Each firm in the portfolio trades its equity securities on the Toronto Stock Exchange. The stock market returns, including dividends, were obtained for each portfolio return in each period of the analysis. These returns are weighted into overall returns to the portfolio in each period.

For each of the same periods, the returns to the Toronto Stock Market for all equity traded on the market were also obtained. The market returns on all firms in the market are contained in Exhibits IX-19 and IX-20 for the periods 1962-1972 and 1973-1983 respectively. The returns to the market firms have been increasing, with minor setbacks, over the entire duration of the charts. Most of these periods have been characterized by bullish markets, high inflation, and high nominal and real interest rates. The correlation between the stock market returns in Canada and the United States is approximately .98. Stock markets generally move in the same directions.

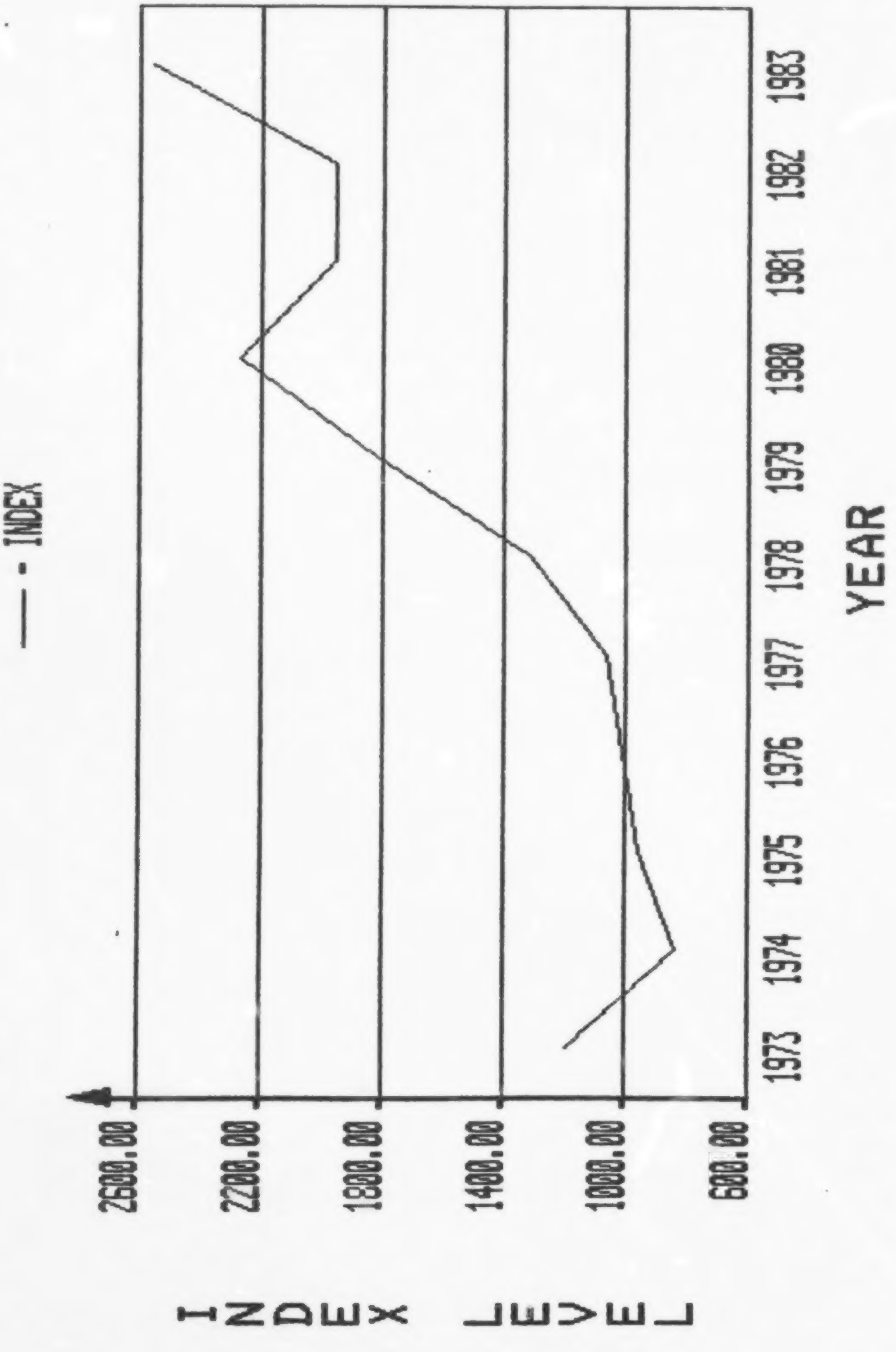
The dividend yields of this same set of firms were also obtained for the same period. For the 1972-1983 period, the

EXHIBIT IX-19



TORONTO STOCK EXCHANGE INDEX 1962-1972

EXHIBIT IX-20



TORONTO STOCK EXCHANGE INDEX 1973-1983

dividend yields of the firms which are listed on the Toronto Stock Exchange firms appear in Exhibit IX-21.

The average of the dividend yields is approximately 4% over the period of Exhibit IX-21 and the market returns on the weighted average indexed shares over the same period is approximately 6.5%. Both figures are close to the long run yields which are typically found on stock markets in Canada and the United States. The dividend yields show a slight decrease. This has been the historical experience for firms which are listed on the stock markets in Canada, and the United States.

The market returns to the shares in the portfolio of traded firms and to the entire market are graphically compared in Exhibit IX-22. In all periods, the portfolio and market returns, while at different levels, are moving together in the same directions over the duration of the graph.

The market returns for each period, of each firm in the portfolio, are regressed on the total market returns for the same period in order to determine the market risk of the portfolio. The regression equation, relating the stock market returns of the portfolio to the Canadian firms which are listed on the Toronto Stock Exhchage, is statistically determined. The resulting regression equation is presented as follows.

EXHIBIT IX-21

CANADIAN DIVIDEND YIELDS 1972-1983

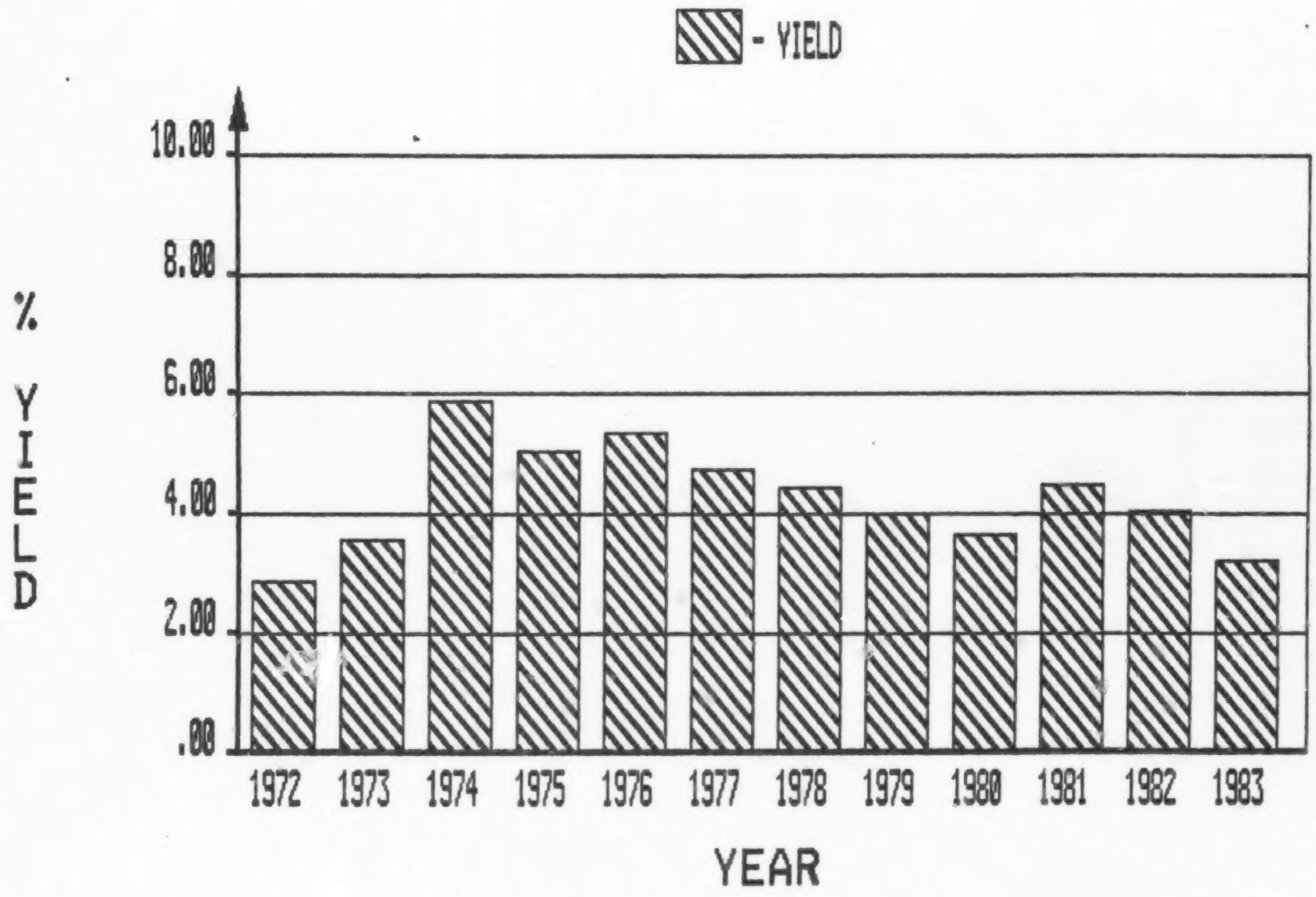
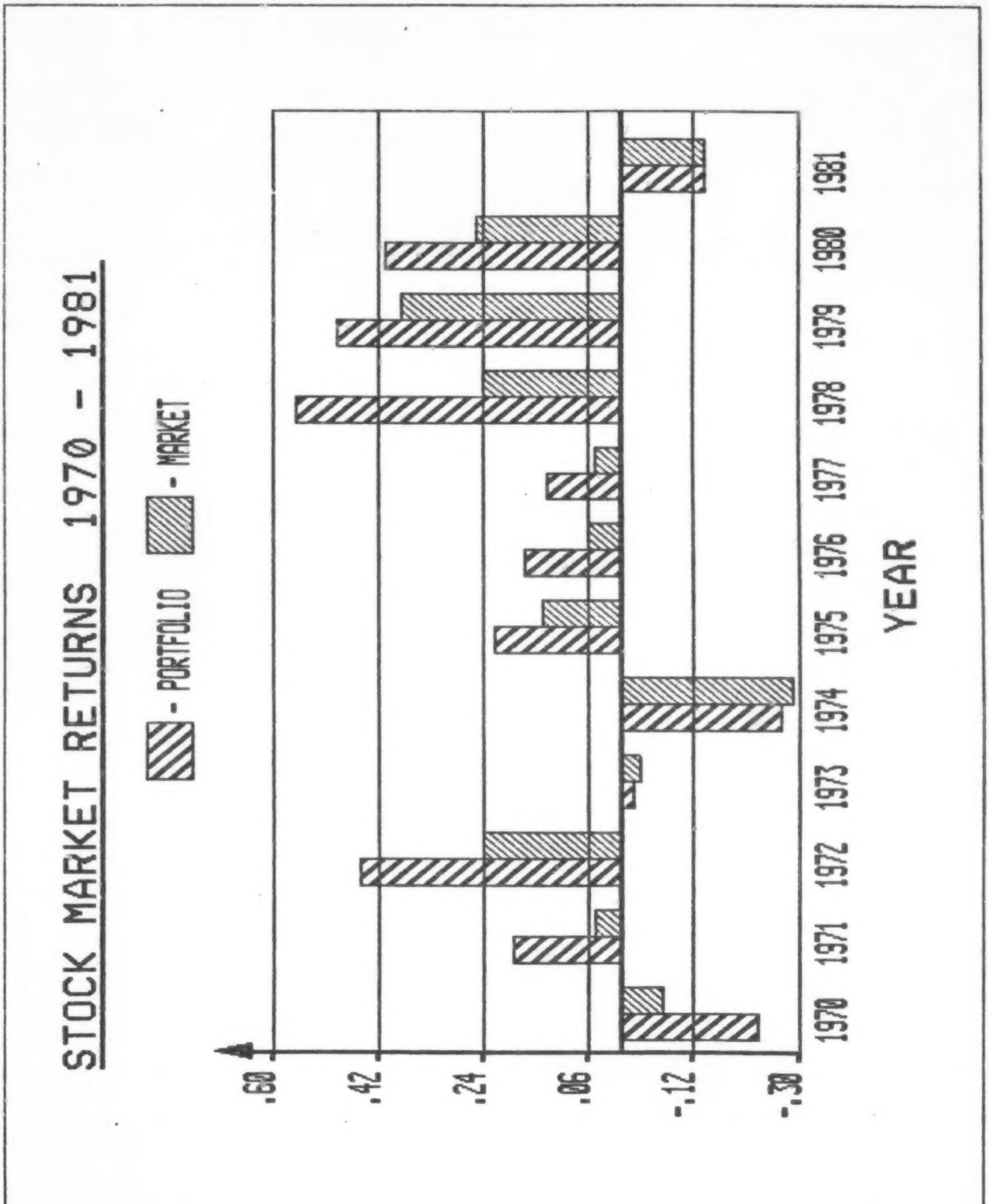


EXHIBIT IX-22



$$R_{Portfolio} = +.0394 + 1.4536\ R_{Market}$$

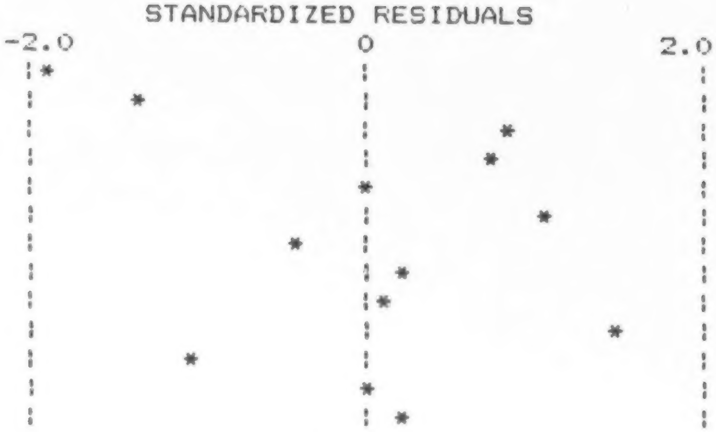
$R_{Portfolio}$ is the market return to the portfolio firms over period.

R_{Market} is the market return to all firms in the market over the same period.

The expected Beta value of a well diversified portfolio is +1.000. For this portfolio, the Beta is +1.4875 indicating higher market risk than the average portfolio of firms in the market. This result is consistent with the NOI and NII regression results which were obtained in originally forming the portfolio. In addition, the coefficient of determination is +.9267,which suggests that most of the variation is captured by the portfolio of firms in the same risk class as Canadian National Railways.

By substituting the returns to the market, the Toronto Stock Exchange, into the portfolio regression equation which was presented previously, the cost of equity capital (ke), of this portfolio of firms, analagous to Canadian National Railways, is found to be 13.2 percent. The plot of the regression residuals of the portfolio regression with the market in Exhibit IX-23 indicates that the variation around the regression line is essentially random which suggests that there is no systematic change occuring with this relationship over the period. Also,

EXHIBIT IX-23
PORTFOLIO REGRESSION
PLOT OF RESIDUALS



because the regression was performed over the period of analysis, the cost of equity capital is the average for that period. For any particular year within the period, the cost of equity capital varies with the return to all firms in the stock market for that year.

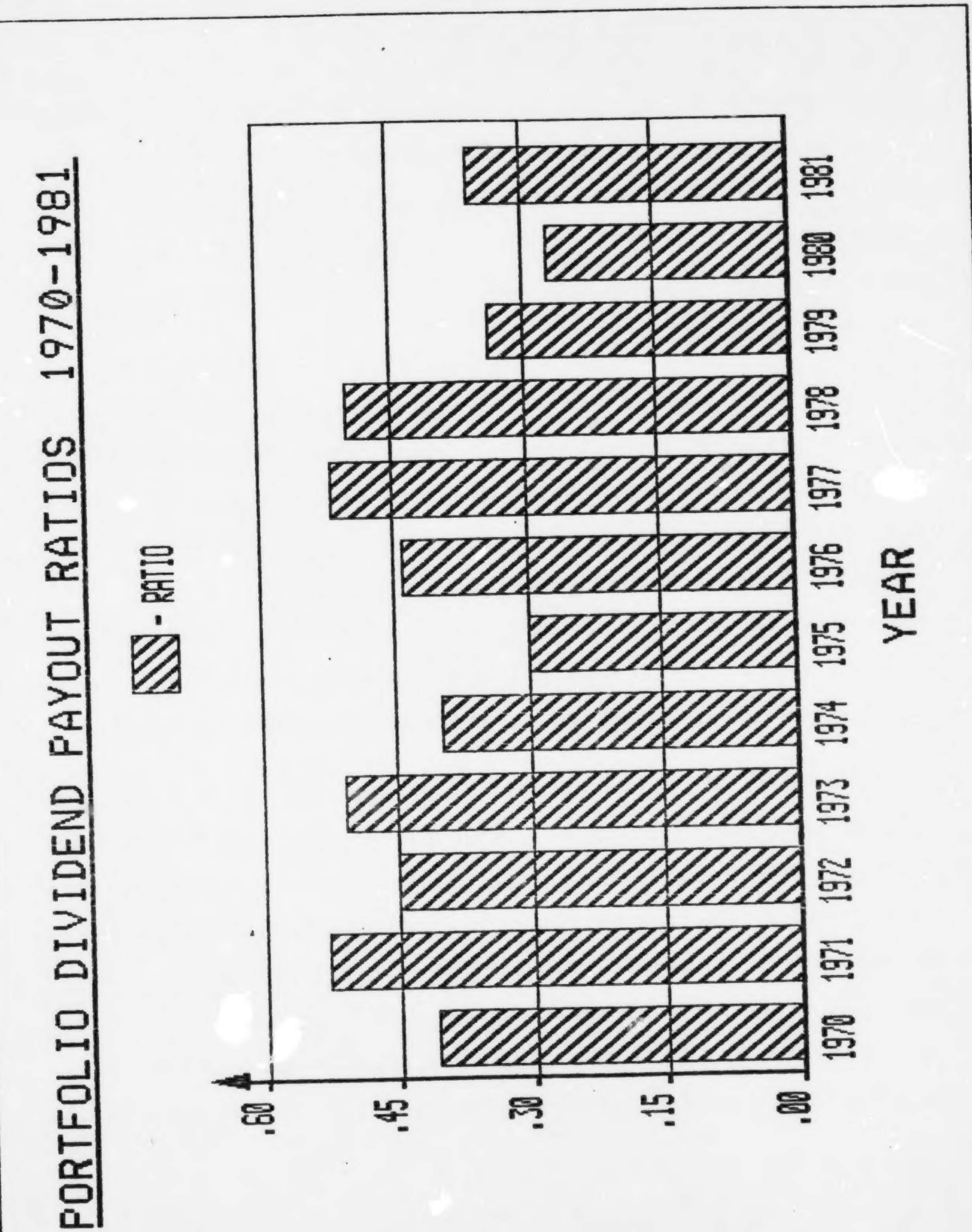
The dividend payout ratios of the portfolio of firms in the same risk class as Canadian National Railways were also calculated for each period. The payout ratio is the proportion of earnings which are available to the common shareholders which are paid out in cash dividends during the year. The average payout ratio of each period is shown in Exhibit IX-24. The average payout ratio over the entire period is 42.31 percent. There has been a slight downward trend in the proportion of earnings which have been paid out as dividends in the chart. A similar downward trend has been experienced in the entire stock market in recent years.

The results of the equity security analysis will be returned to after examining the structure and cost of debt of Canadian National Railways.

D. Debt Valuation

The proportion of debt in the financial structure of

EXHIBIT IX-24

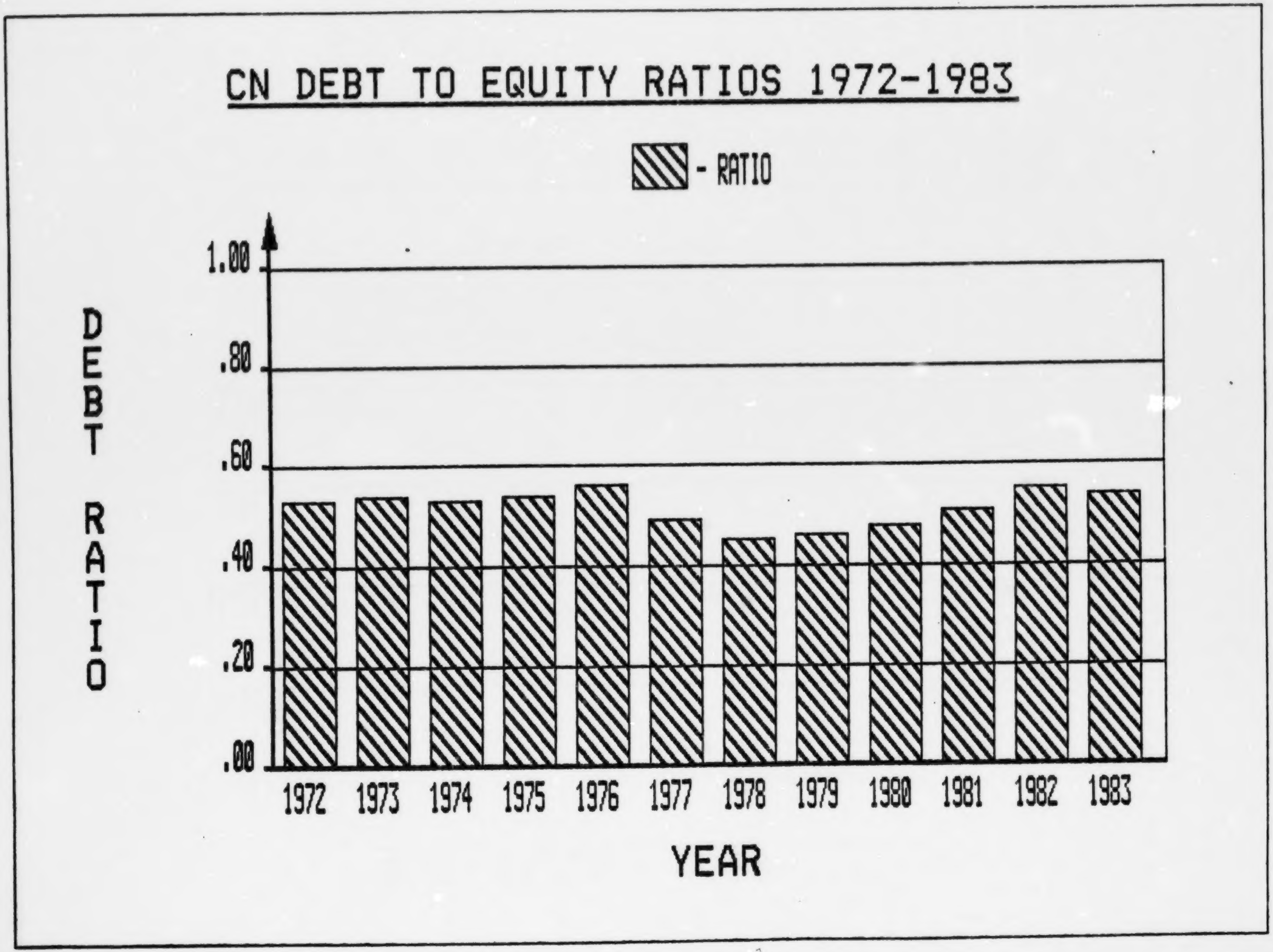


Canadian National Railways has remained fairly constant. Exhibit IX-25 shows the total debt, current and long term debt, as a percentage of total debt plus equity. The effect of financial reorganization in 1978 is clearly apparent although the debt proportion of total equity seems to have returned to previous levels.

Market rates of interest on equivalent risk debt have risen substantially in recent years. This is clearly evident in Exhibits IX-26 and IX-27 which show the market rates of interest for 1960 to 1971 and 1972 to 1983 years respectively. These changes in the market rate of interest on equivalent debt affect the valuation of the long term debt of Canadian National Railways in each year. The market rate of interest was referred to as (ki) in the theoretical discussions of Chapters VII and VIII.

The book, or coupon rate of interest tends to be lower than market rates for existing debt when market rates of interest are rising. Each separate item of long term debt in the financial structure of Canadian National Railways is revalued, using the market rate of interest, for each period of the analysis. These separate items for each year are then added together to yield the total market value of the long term debt of Canadian National Railways. The market value of long term debt is compared to the

EXHIBIT IX-25



CN DEBT TO EQUITY RATIOS 1972-1983

EXHIBIT IX-26

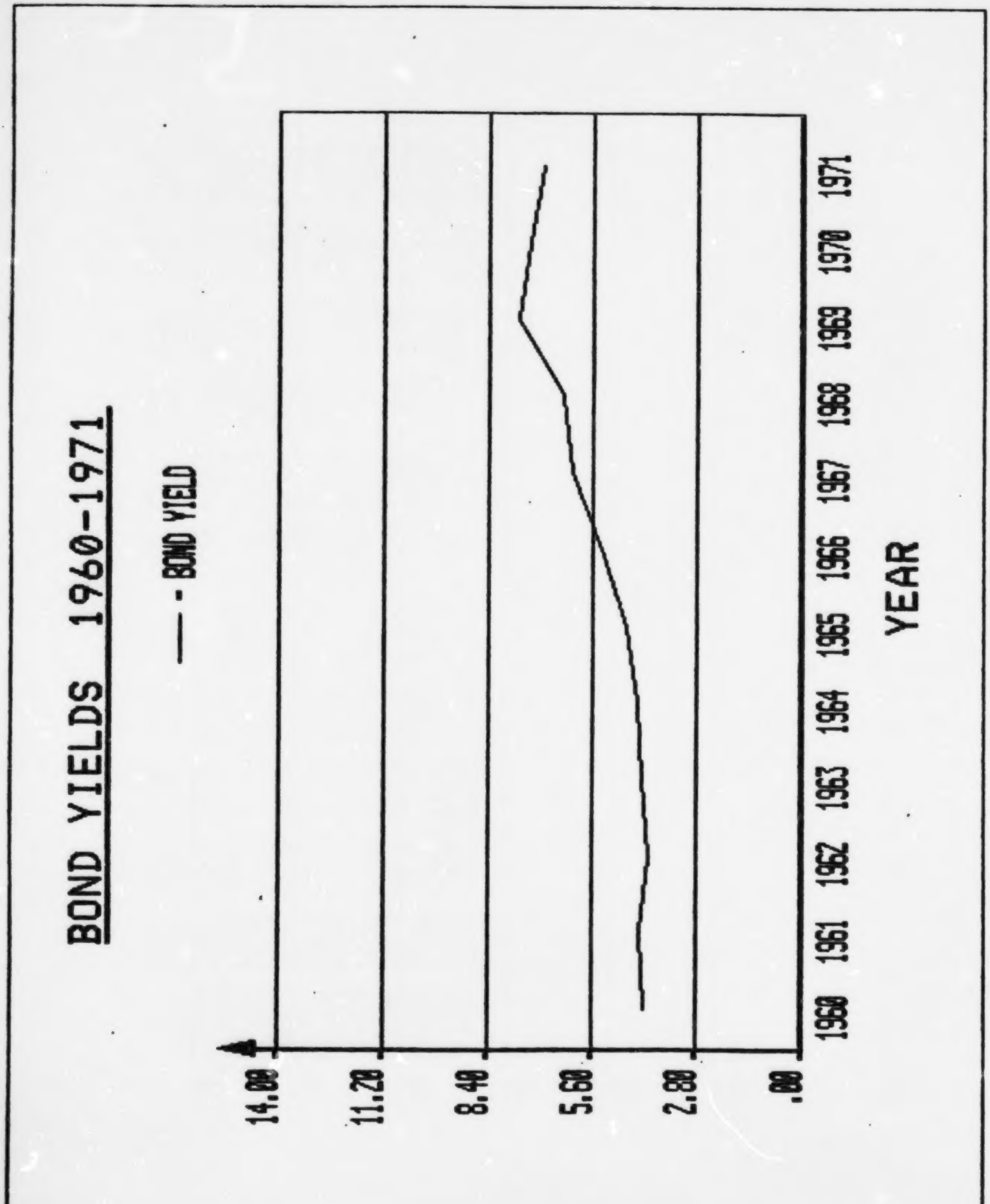
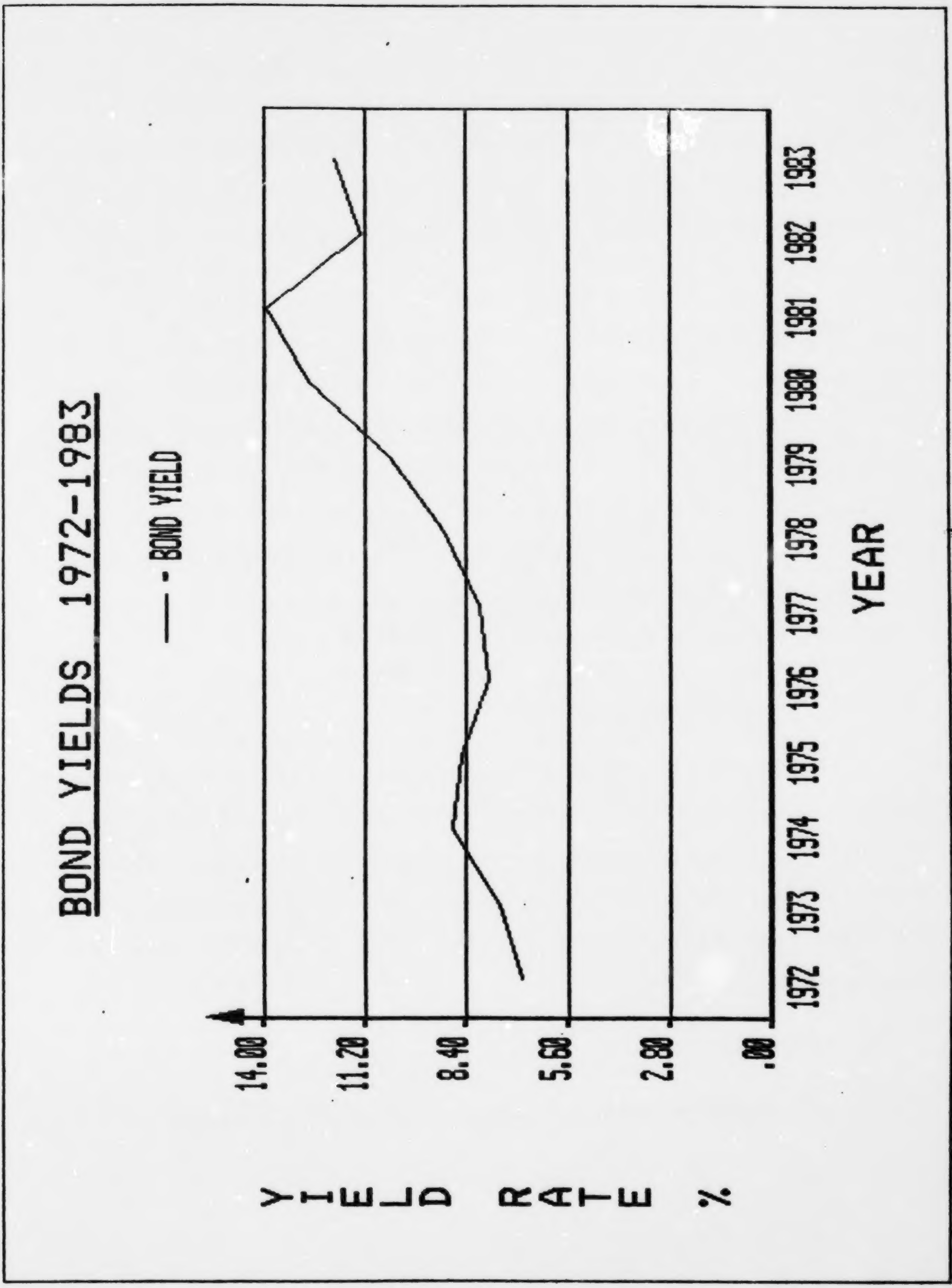


EXHIBIT IX-27



book value of the debt, as it appeared in the corporation's financial records, in Exhibit IX-28. The difference in each year is caused by the fact that the market rate of interest is higher than the average coupon or book rate of interest on the long term debt.

The market value of long term debt was referred to as, B, in the theoretical discussion of the previous chapters. It is these values, together with the market rates of interest, which are used in the calculation of the Cost of Capital. Book values will not be used because they generate different results which do not reflect the current cost of borrowing or replacing the existing debt and therefore, do not provide information for valuing the financial structure of the corporation.

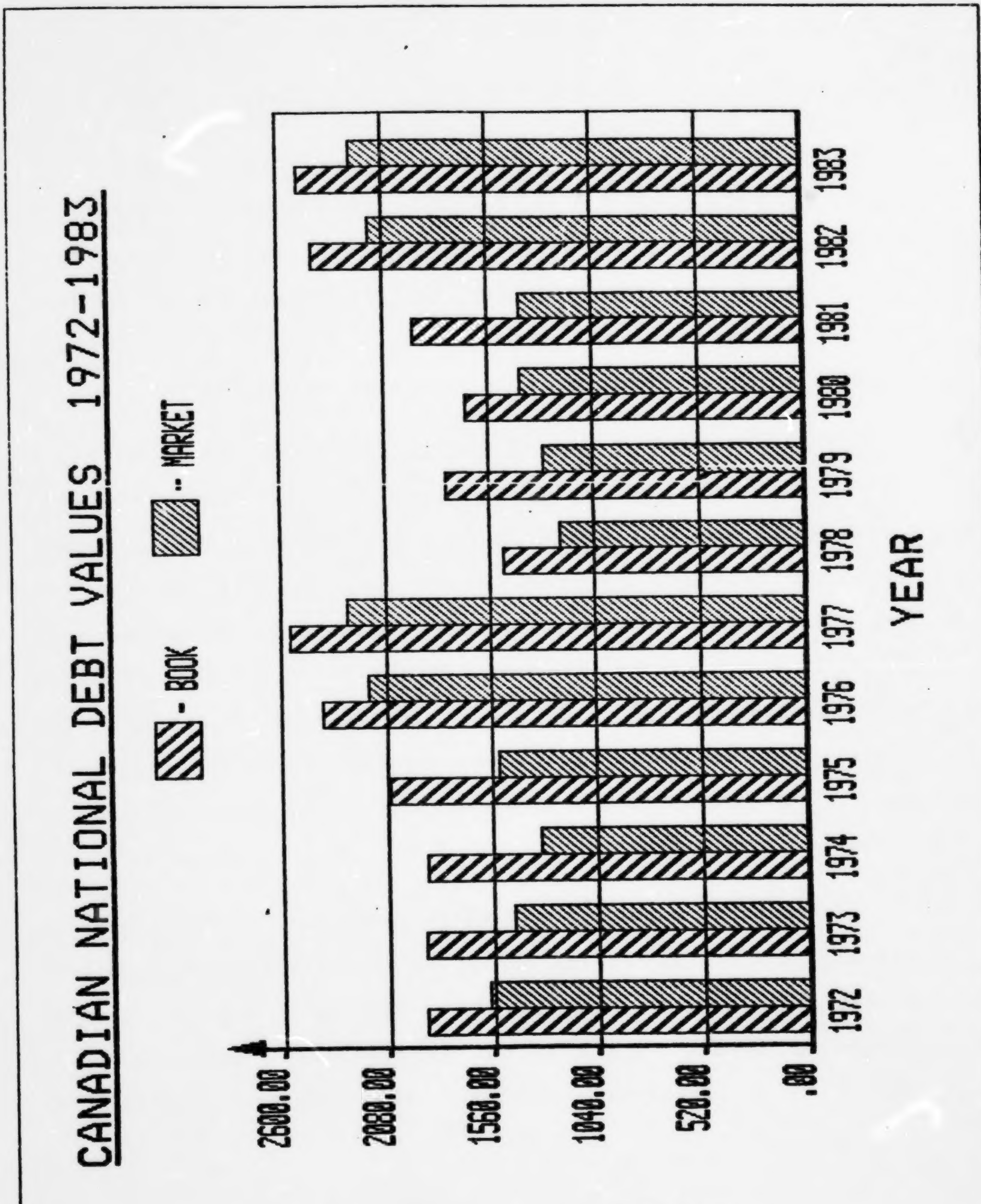
E. Cost of Capital Calculations

In the previous section, the cost of debt (ki), and the market value of debt (B) of Canadian National Railways were measured. The equivalent cost of equity capital (ke) was measured in the section on portfolio and market returns. The weighted average cost of equity will be calculated from the following formula.

$$\text{Cost of Capital} = ki \frac{B}{B + E} + ke \frac{E}{B + E}$$

The final variable which is required in order to perform this

EXHIBIT IX-28



calculation is E, the value of the firm's equity.

For a firm which has its securities traded on the stock market, equity market value is determined by the trading which occurs in that security establishing prices, and therefore, fair market value. As this direct approach is closed due to the fact that Canadian National Railways does not trade on a stock market, an indirect approach to valuation is necessary.

Market values of securites are derived from evaluations of risk and return, primarily as these related to the expected earnings stream. Determining the expected, permanent earnings stream of a firm, is perhaps the most tenuous part of the analysis. Many models of the earnings generation process exist in practice and research, and there is not doubt that the earnings model is important in valuation. Valuations are sensitive to the levels and changes in expectations regarding income, being the source of dividends expectations, risk of return, and the possibility of default.

Earnings of a company can shift dramatically from period to period. But it isn't these period to period shifts which affect market valuations as dramatically as changes in the long term or permanent income stream of the corporation. Since security valuation is primarily a long term process, short run fluctuations are of minor importance. This issue, is endeavoured to be pointed out, as being present whether market values, book values, or some other method of analysis is employed in making cost of capital calculations. In other words, the "true" income stream would improve all estimates of the cost of capital.

Empirical studies of earnings streams have shown that simple extrapolative models provide reasonable estimates of permanent income.[1] These estimates can be superior to internal management estimates which do not forsee external factors, and external, financial analysts estimates which do not contain inside management information. Both sources have been found to be tempered or biased by the expected, specific uses of the information. Neither of these sources are available and this analysis is directed primarily towards analysis and extrapolation rather than prediction. Further, the validity of exponential smoothing or rigourous time series fitting of the income stream has not been validated for Canadian National Railways. Therefore, an extrapolative regression format and the actual earnings figures are used to determine the permanent earnings.

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1. See, Abdel-Kahlik, R. and J. Thompson, "Research on Earnings Forecasts", Accounting Journal, Winter, 1977-1978, for a summary of fifty seven simple models.

In Exhibit IX-29, the regession residuals around the time line of Canadian National Railway's income figures are presented. The projected, 1983 income, from the previous fifty-six years is $12.806 million. While the function, and the numbers are mathematically correct, the significant shift in the recent income stream strongly suggests that the estimate is low. The recent income experience, is different from the past. It is affected by a different set of economic conditions, such as interest rates and market returns, world events, such as WW II, the depression, energy costs, and company factors, such as reorganization and disinvestment of divisions. Consequently, while the preference is always for a longer income stream in order to do financial analysis, for the reasons provided, a shorter income stream is used. What is lost in statistical confidence is hopefully overcome by increased relevance. In addition, there is a desire in the analysis to explicitly recognize the 1977/1978 financial reorganization which similarly, affects the choice of the period of analysis.

The purpose of determining appropriate income figures is that dividends from those earnings can be determined, and then capitalized in order to yield value. Changes in income are accounted for by the inclusion of the growth rate in the capitalization formula and therefore, a representative income

EXHIBIT IX-30
CANADIAN NATIONAL RAILWAYS
PLOT OF REGRESSION RESIDUALS

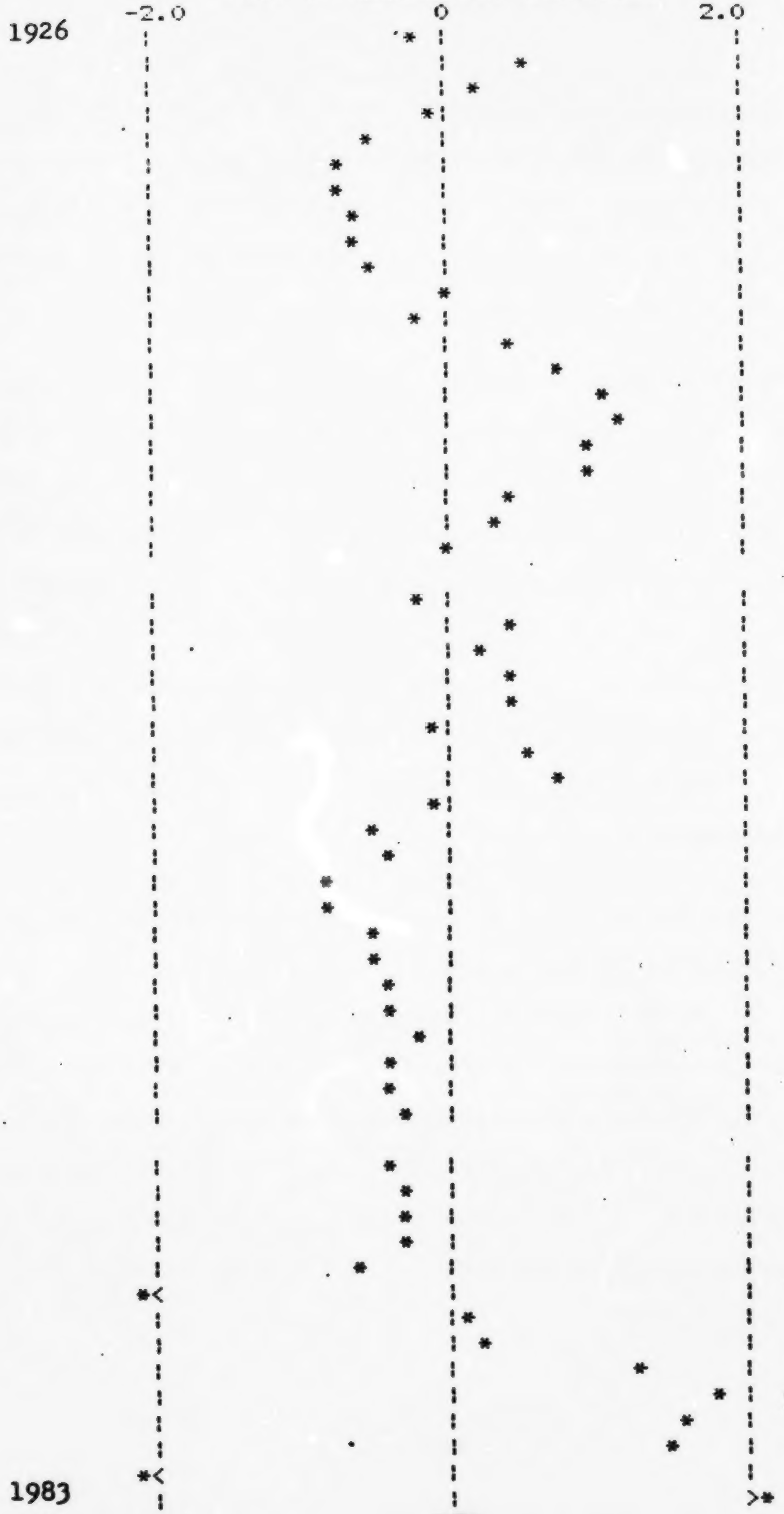

figure for the period is desired, not the income of any particular year, which is already established simply by examining the actual results. Similarly, the market returns and ultimately, the cost of capital, only has meaning in the context of a number of consecutive years.

In order to examine currently representative income numbers, the focus of the analysis has been, and is, on the recent twelve year period, 1972-1983. The twelve year period is divided into two, 1972-1977 before reorganization, and 1978-1983 or after reorganization. The average income for the first period was -$36.071 million. Negative earnings over a period of time cannot be capitalized, and indeed, sustained losses usually lead to default. With Canadian National Railways, of course, this has not occured. Canadian National Railways has continued in spite of continuing financial losses.

The average income for the second period is $65.080 million. The estimatedfigure (normalstream) is $68.463 million which complements the actual result. The estimated earnings which are representative of the total period of analysis is $59.205. These figures are the result of trials with various models and time frames. It should also be noted that the actual income is higher than these figures in some periods, but at the same time, the actual losses have been historically higher as well. The income figures include both positive and negative income for the period, as this is the past, and present reality of the company's performance.

The income figures are used in order to determine valuation. In order to add validity to this process, three valuation models are used which should establish convergence of the data and engender confidence in the results.

1. The first model is the dividend capitalization or growth rate model. The theoretical exposition of this model is contained in Chapter VII, Section 3. Four valuations are produced using this model; the twelve year period and each of the six year periods. The formula is as follows.

$$E = \frac{NI \times \text{Dividend Payout Ratio}}{ke - g}$$

The variables in the formula are specifically measured for the approriate periods. The results are contained below.

METHOD	PERIOD	EQUITY VALUE (E) $(000)
Estimated	1972-1983	498,527
Actual	1978-1983	584,844
Estimated	1978-1983	597,844
Estimated	1972-1977	399,210

The actual (average) figure for the 1978-1983 period is calculated in order to demonstrate convergence with the estimates. The 1972-1977 estimate is derived from a linear valuation model.

2. The second model is a dividend yield model.

$$\text{Dividend Yield} = \frac{\text{Dividends}}{\text{Equity (E)}}$$

$$E = \text{Dividends/Dividend Yield}$$

The income numbers of the periods in the analysis are multiplied by the dividend payout ratio of the portfolio of firms in the same risk class as Canadian National Railways in order to measure the estimated dividends. The dividend yields were also obtained for this same group of companies. (See, Exhibit IX-24, Section C). The equity values which are obtained from dividing the dividend yield into the dividends are contained below.

METHOD	PERIOD	EQUITY VALUE (E) ($000)
Estimated	1972-1983	565,448
Actual	1978-1983	637,939
Estimated	1978-1983	659,939
Estimated	1972-1977	492,958

Again, both the 1978-1983 figures are presented for comparison.

3. The final approach uses the price/earnings model. The price per share, P, and the earnings per share ,eps, when multiplied by the number of shares produce ,E, and total net income ,NI, respectively.

$$\frac{P}{eps} = \text{Price-Earnings Ratio}$$

$$E = NI/ \text{ Price-Earnings Ratio}$$

The price/earnings ratios of the railroad industry were used in the calculation. Aggregation of the company data to determine the industry ratio was done in two steps, the objective being to minimize the influence of comapnies with abnormal P/E ratios:(1) an average was computed only for those companies whose P/E ratios were greater than zero. (2) Each remaining company's P/E ratio was compared to the average and companies were eliminated with a P/E factor greater than two; and a final average was calculated. The results which are obtained for Canadian National Railways are below.

METHOD	YEAR	EQUITY (E) ($000)
Estimate	1972-1983	522,780
Actual	1978-1983	574,665
Estimate	1978-1983	604,528
Estimate	1972-1977	441,032

The equity valuation figures are all within an acceptable range of each other. They are, however, based upon earnings estimates and if these estimates changes, the valuations also change.

From the equity valuations ,E, the cost of capital can be obtained based upon market values, rather than book values. The cost of capital is not particularly sensitive to the differences between equity figures which vary among the methods. Among the three valuation methods, a high, intermediate, and low value is observable. These are not the statistical extremes of the error rate, only levels of the variable, E.

The equity values, E, when combined with the market value of the debt, B, for each period, produce the debt to total equity ratios which are contained in Exhibit IX-30.

EXHIBIT IX-30
CANADIAN NATIONAL RAILWAYS
DEBT TO TOTAL EQUITY RATIOS

	B/B+E		E/B+E	
E LEVEL	MARKET	BOOK	MARKET	BOOK
1972-1983				
High	.74691	.42023	.25309	.57977
Intermediate	.76145	.42023	.23855	.57977
Low	.76977	.42023	.23002	.57977
1978-1983				
High	.71688	.37872	.28581	.62128
Intermediate	.73418	.37872	.26581	.62128
Low	.73640	.37872	.26360	.62128
1972-1977				
High	.77745	.46680	.22255	.53319
Intermediate	.79611	.46680	.20399	.53319
Low	.81181	.46680	.18819	.53319

The effect of using market values instead of book values is clearly apparent in each of the rows of this exhibit. The proportionate amount of debt in the financial structure is considerably higher in all periods than the book values would tend to indicate. In addition, the effect of the financial reorganization between the two sub-periods is less pronounced when market values are considered.

The final step is to combine the figures of Exhibit IX-30 with market returns which were determined in Section C of this chapter and the market rates of interest from Section D. The cost of capital for the period of analysis, using the intermediate valuation, is as follows.

AVERAGE COST OF CAPITAL
CANADIAN NATIONAL RAILWAYS
1972-1983

COST OF CAPITAL = .097525 (.76145) + .1318 (.23855)

COST OF CAPITAL = 10.556%

Using the high and low models, the figures are 10.7% and 10.45% respectively. In an effort to compare these figures, an approximation from the railway industry was obtained. The cost of capital, by sustituting book for market value of the debt only, is 10.5% for the same period.

The analysis is only valid for the entire time frame shown. In order to determine the impact of changes in interest rates and market returns, an estimate of the cost of capital was obtained for the two sub-periods. The average market interest rate increased from 7.917% in the early period to 11.598% in the later period. Market returns increased from 8.333% to 16.67% over the same period. The effect is a short term rise in the cost of capital from 8.40% to 12.89% from the early period to the later one.

The market figures are affected by inflation, interest rates, and returns to the stock market over the period. Consequently, because market valuations depend upon actual data for the time period, they are also influenced by those economic and market conditions.

Prior to closing the discussion of Canadian National Railways, several points from the analysis will be summarized.

1. The growth of net operating income of Canadian National is approximately the same as similar firms in the industry suggesting operating efficiency.
2. The net operating income after interest exhibits considerable variation indicating high levels of free market financial risk.
3. The market risk class is therefore, higher than the average firm in the market, requiring a higher than average return on equity.

4. Share equity is not a cheap form of financing to this firm.

5. The debt proportion of the financial structure in market terms is 75% as compared to approximately 42%, using book values.

6. The debt structure does not adjust substantially to the varying cost of debt and equity resulting in a greater than average variation in earnings.

7. The effect is that the growth rate of net income is not as high as other firms increasing the risk.

8. The level of net income is not sufficient to generate market values which approximate the book values.

9. The firm has maintainable, public enterprise earnings levels but not private, free market earnings levels.

10. The cost of capital, given the economic conditions, methodology, and constraints on the data analysis, is found to be 10.5% for the period.

The primary purpose of these analyses has been to apply the market valuation methodology. The analyses in this chapter, and the theoretical discussion of the previous chapters, have emphasized the conditions and limitations of the demonstrated approach, which also exist with all financial evaluations when values have not been established by markets.

CHAPTER X

ESTIMATING THE COST OF CAPITAL FOR AIR CANADA

X. ESTIMATING THE COST OF CAPITAL FOR AIR CANADA

A. Introduction

In the previous chapter, the methodology of market valuation was applied to Canadian National Railways. The focus of this chapter is on another major Canadian public enterprise, Air Canada. In many respects, the analyses are similar. The previous discussion and analyses of the economy growth rates, market interest rates, and stock market returns also applies to this chapter. This work has already been done and presented and applies to Air Canada. In order to maintain the consistency of discussion, some of the information which was presented in the previous chapter will be repeated or referred to here as the need arises. In other respects, however, the two public corporations are very different, and hence the need for separate analysis of Air Canada. For these reasons, this chapter is considerably shorter than the previous one on Canadian National Railways, although the length and depth of actual analysis is approximately the same.

As in the previous case, the results concerning Air Canada should be construed as a methodological demonstration and not as an evaluation of superior or inferior performance. In addition, uses of the figures for other than the intended purposes of this study are considered to be at the user's risk.

B. Income and Growth

As in the previous chapter, the first exhibit in this chapter, Exhibit X-1, presents the historical financial summary of the public enterprise. These data were obtained from the Financial Post Databank. This exhibit is presented only for information as the detail information for the ensuing analyses were obtained from other sources. Neverthless, this exhibit assists in putting the subsequent analyses of Air Canada into perspective.

This exhibit covers the past forty-six years. There has been a consistent rise in Total Assets in column 1 and Total revenue in column 6. Long term debt and net income however, have fluctuated widely. Long term debt decreased from $919 million in 1977 to $592 million in 1978 as a result of financial reorganization but has since increased to $1,092 million.

Positive net income has been generated in thirty-two of the forty-six periods contained in the table. It is also apparent that the sizes of the positive and deficit (d) net income figures, throughout the 1970's and 1980's, are not consistent with the fluctuations around the breakeven point of the prior historical series.

EXHIBIT X-1
AIR CANADA
FINANCIAL SUMMARY 1938-1983

HISTORICAL SUMMARY

Fiscal Year	Total Assets	Net Fixed Assets	Accum. Deprec. & Amort.	L.-term Debt $000's	Working Capital	Total Revenue	Net Inc. Opers.
1938	3,410	2,507	271		655	590	d818
1939	4,157	3,085	634		795	2,350	d411
1940	5,019	3,526	1,332		952	4,592	539
1941	5,828	3,232	1,878		1,618	5,807	302
1942	7,365	4,379	1,504		1,953	7,337	494
1943	8,270	3,461	2,370		2,845	9,379	147
1944	8,818	3,635	3,025		2,611	9,182	7
1945	9,764	3,514	3,848		2,650	10,512	32
1946	13,926	7,537	5,444		d1,091	12,810	d1,115
1947	30,786	21,566	5,992		d80	20,780	d1,824
1948	36,024	24,545	5,890		2,340	31,728	d2,933
1949	34,339	21,118	9,865		4,369	36,748	d4,317
1950	35,783	16,682	13,444		9,097	40,155	d1,325
1951	41,651	14,252	16,777		2,519	48,010	3,890
1952	44,847	11,104	20,[illegible]		330	55,057	807
1953	45,480	11,125	25,[illegible]		12,739	62,236	256
1954	49,365	26,340	28,066		3,089	68,764	486
1955	61,792	36,707	31,513		2,965	77,428	190
1956	69,558	40,375	37,056		7,745	91,308	1,558
1957	95,045	56,563	42,411		811	104,995	404
1958	119,066	71,036	49,869		6,077	120,554	547
1959	175,412	89,057	61,023		10,458	134,678	152
1960	248,607	144,538	72,850		16,484	148,986	d2,807
1961	278,725	210,242	69,894		11,427	165,435	6,460
1962	274,311	202,600	72,224		22,620	183,473	d3,540
1963	269,342	207,316	88,629		27,078	199,390	827
1964	275,360	205,497	105,367		31,272	213,909	1,405
1965	287,927	182,048	132,513		51,139	250,125	3,989
1966	306,487	195,967	164,870		27,615	289,943	2,909
1967	387,450	252,135	198,742		16,550	345,611	3,547
1968	508,391	355,322	230,142		11,538	387,828	8,184
1969	594,912	396,637	228,453		10,503	464,652	1,548
1970	707,900	453,516	268,594		d252	478,259	d1,072
1971	800,020	567,778	315,320		22,747	508,341	1,662
1972	834,262	566,777	331,271	640,642	27,055	583,262	8,648
1973	995,893	■826,737	401,632	695,670	d61,157	698,050	6,123
1974	1,167,947	926,083	455,613	902,979	27,025	848,582	d9,225
1975	1,297,628	947,784	540,904	1,083,625	98,606	957,180	d12,473
1976	1,149,100	874,424	622,577	914,270	14,718	1,057,484	d10,456
1977	1,243,604	818,666	674,431	919,060	130,069	1,187,656	20,006
1978	1,333,494	783,842	784,109	592,432	289,480	1,322,597	47,465
1979	1,605,824	917,990	858,218	613,310	221,531	1,595,172	55,369
1980	1,687,788	1,079,383	956,658	633,435	149,971	1,905,862	57,042
1981	1,869,928	1,410,860	1,038,068	710,022	d54,135	2,258,231	40,128
1982	2,040,588	1,558,915	1,148,082	891,801	d107,435	2,305,895	d15,803
1983	2,190,567	1,758,699	1,252,457	1,092,495	d132,516	2,298,465	6,090

■ Includes progress payments in 1973 and subsequently.

In order to more clearly observe this characteristic, the net income figures appear in the scattergram in Exhibit X-2. Graphically, Exhibit X-2 reveals that the recent net income experience of Air Canada does not follow the long-term pattern. This is also noticeable statistically. In Exhibit X-3, the net income figures of Air Canada are fitted to a linear regression for the forty-six year period. The plot of the residuals of the regression, and the sizes of the residuals, indicate a change in variability and direction of the income stream in the recent period.

The income scattergram for the immediate thirteen year period appears in Exhibit X-4, which strongly suggests the presence of a recent cycle in the data. The plot of the residuals from the regression of this period, which appears in Exhibit X-5,supports this finding and also serves to point out the increase in variability, and hence the recent risk of the income stream over this period. These structural changes place the analytical emphasis in this chapter on the recent, rather than distant past, concerning the financial organization and relative performance of Air Canada.

Since Air Canada regularly publishes its financial results, these data are publicly available. The first data requirement,

EXHIBIT X-2
AIR CANADA
SCATTERGRAM: NET INCOME BY YEAR

```
NII
57042                                                               * *
+
+                                                                   *
+
+                                                                        *
+
+
+
+
+
+                                                                 *
+
+
+                                                  *      *
+                      *               *      *  *         *               *
+   * * ** * *          * * ** * ** *      **   *    *  *
+* *          * * *  *                *  *            *
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+ + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + + 198
                                                                     YEAR
HORIZONTAL AXIS:   YEAR
 LEFT ENDPOINT:    1938        RIGHT ENDPOINT:  1983

VERTICAL AXIS:    NII
 LOWER ENDPOINT: -15803        UPPER ENDPOINT:  57042

HEADER DATA FOR: B:ACNII       LABEL: A
NUMBER OF CASES:  46           NUMBER OF VARIABLES:  2
```

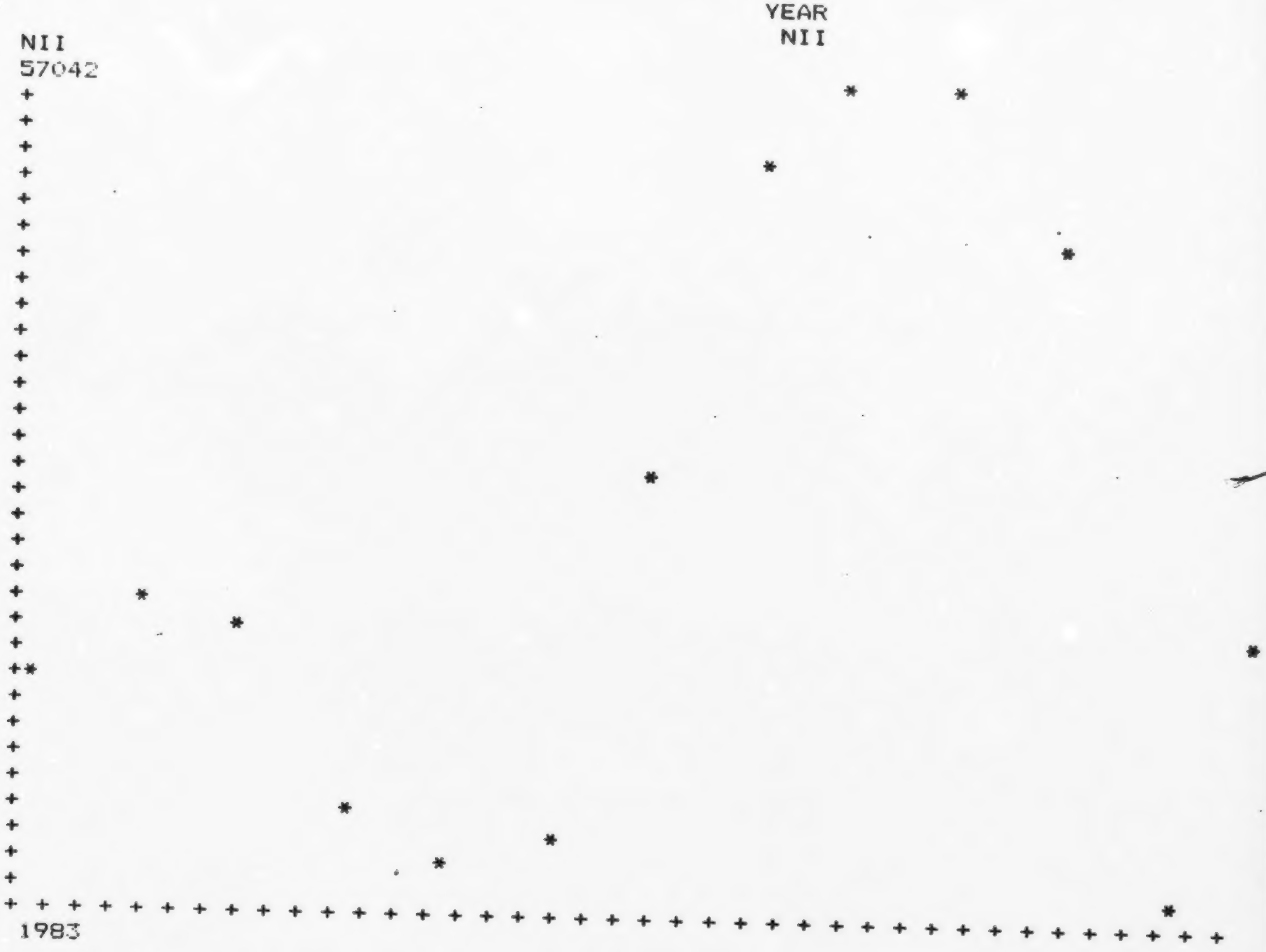
EXHIBIT X-3
AIR CANADA
REGRESSION RESIDUALS

```
                                            STANDARDIZED RESIDUALS
     OBSERVED CALCULATED   RESIDUAL -2.0               0                 2.0
 1   -818.000  -6040.324   5222.324 !                  !   *              !
 2   -411.000  -5565.862   5154.862 !                  !   *              !
 3    539.000  -5091.400   5630.400 !                  !   *              !
 4    302.000  -4616.939   4918.939 !                  !   *              !
 5    494.000  -4142.477   4636.477 !                  !  *               !
 6    147.000  -3668.015   3815.015 !                  !  *               !
 7      7.000  -3193.553   3200.553 !                  !  *               !
 8     32.000  -2719.092   2751.092 !                  ! *                !
 9  -1115.000  -2244.630   1129.630 !                  !*                 !
10  -1624.000  -1770.168    146.168 !                  *                  !
11  -2933.000  -1295.706  -1637.294 !                 *!                  !
12  -4317.000   -821.245  -3495.755 !                *  !                  !
13  -1325.000   -346.783   -978.217 !                 *!                  !
14   3890.000    127.679   3762.321 !                  !  *               !
15    807.000    602.140    204.860 !                  *                  !
16    256.000   1076.602   -820.602 !                 *!                  !
17    496.000   1551.064  -1055.064 !                 *!                  !
18    190.000   2025.526  -1835.526 !                 *!                  !
19   1556.000   2499.987   -943.987 !                 *!                  !
20    404.000   2974.449  -2570.449 !                *  !                  !
21    547.000   3448.911  -2901.911 !                *  !                  !

22    152.000   3923.373  -3771.373 !               *   !                  !
23  -2607.000   4397.834  -7004.834 !             *     !                  !
24   6450.000   4872.296   1577.704 !                  !*                 !
25  -3540.000   5346.758  -8886.758 !           *       !                  !
26    527.000   5821.220  -5294.220 !              *    !                  !
27   1405.000   6295.681  -4890.681 !               *   !                  !
28   3989.000   6770.143  -2781.143 !                *  !                  !
29   2909.000   7244.605  -4335.605 !               *   !                  !
30   3547.000   7719.066  -4172.066 !               *   !                  !
31   8184.000   8193.528     -9.528 !                  *                  !
32   1548.000   8667.990  -7119.990 !             *     !                  !
33  -1072.000   9142.452 -10214.452 !          *        !                  !
34   1662.000   9616.913  -7954.913 !           *       !                  !
35   8648.000  10091.375  -1443.375 !                 *!                  !
36   6123.000  10565.837  -4442.837 !               *   !                  !
37  -9225.000  11040.299 -20265.299 !   *               !                  !
38 -12473.000  11514.760 -23987.760 !*                  !                  !
39 -10455.000  11989.222 -22444.222 ! *                 !                  !
40  20006.000  12463.684   7542.316 !                  !                  !
41  47485.000  12938.146  34546.854 !                  !                  >*
42  55369.000  13412.607  41956.393 !                  !                  >*

43  57042.000  13887.069  43154.931 !                  !                  >*
44  40128.000  14361.531  25766.469 !                  !                 *!
45 -15803.000  14835.992 -30638.992 *<                 !                  !
46   6090.000  15310.454  -9220.454 !           *       !                  !
```

EXHIBIT X-4
AIR CANADA
SCATTERGRAM
NET INCOME

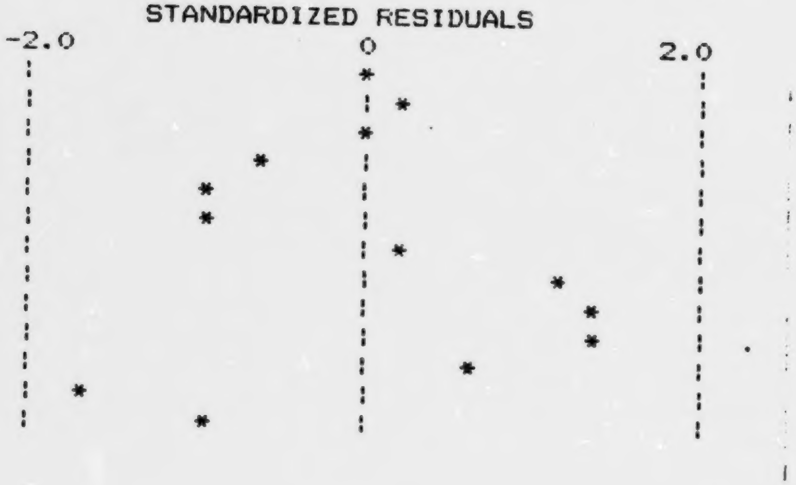


```
HORIZONTAL AXIS:  YEAR                                                    YEAR
 LEFT ENDPOINT:   1971        RIGHT ENDPOINT:  1983

VERTICAL AXIS:   NII
 LOWER ENDPOINT: -15803       UPPER ENDPOINT:  57042

HEADER DATA FOR: B:ACNIIS     LABEL: A
NUMBER OF CASES:  13          NUMBER OF VARIABLES:  2
```

EXHIBIT X-5
AIR CANADA
REGRESSION RESIDUALS
NET INCOME PER YEAR



and step in the methodology, is to determine the Net Operating Income (NOI)figures for Air Canada. Net operating income reflects the operating results, before any financial charges for the period.

Exhibit X-6 is the graph of net operating income from 1962 to 1972. Exhibit X-7 extends the series from 1973-1983. Net operating income has increased substantially over these periods. However, the NOI series is prone to set-backs in 1969, 1974, 1978, and difficult years occured in 1982 and 1983. Many significant factors underlie this series such as the energy crisis in the early 1970's and deregulation of much of the airline industry in the late 1970's.

In order to examine the relative strength of the series, similar data were obtained from twenty-two other airlines, primarily in the United States. The weighted averages of these figures will be referred to as the industry figures.

The growth rates of NOI were calculated for Air Canada and the airline industry. These growth rates are compared graphically in Exhibit X-8. The annual growth rates for Air Canada do not correspond very well to the growth rates which are found for the industry.

A time series regression was performed on the NOI growth

EXHIBIT X-6

NET OPERATING INCOME AIR CANADA (1)

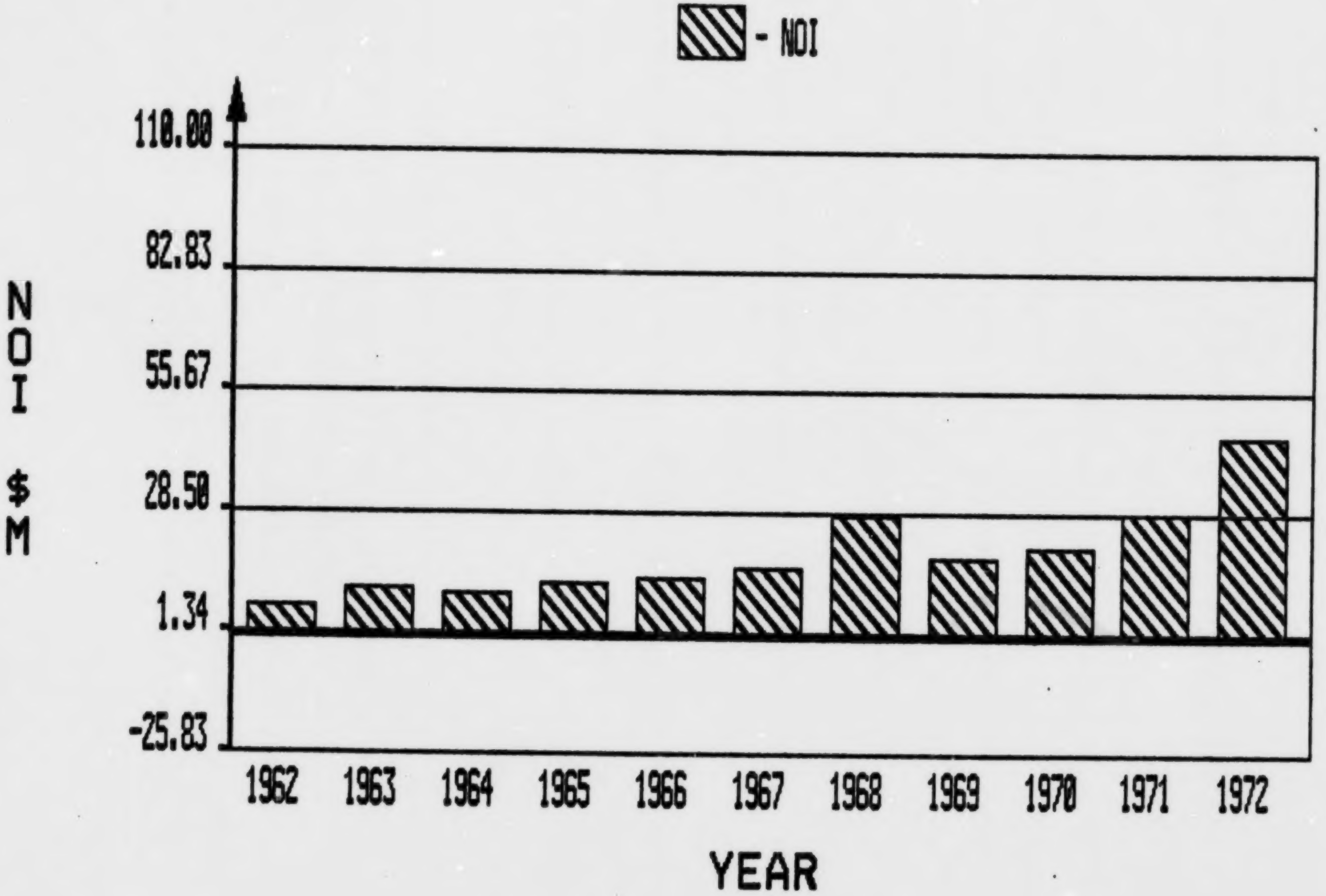


EXHIBIT X-7

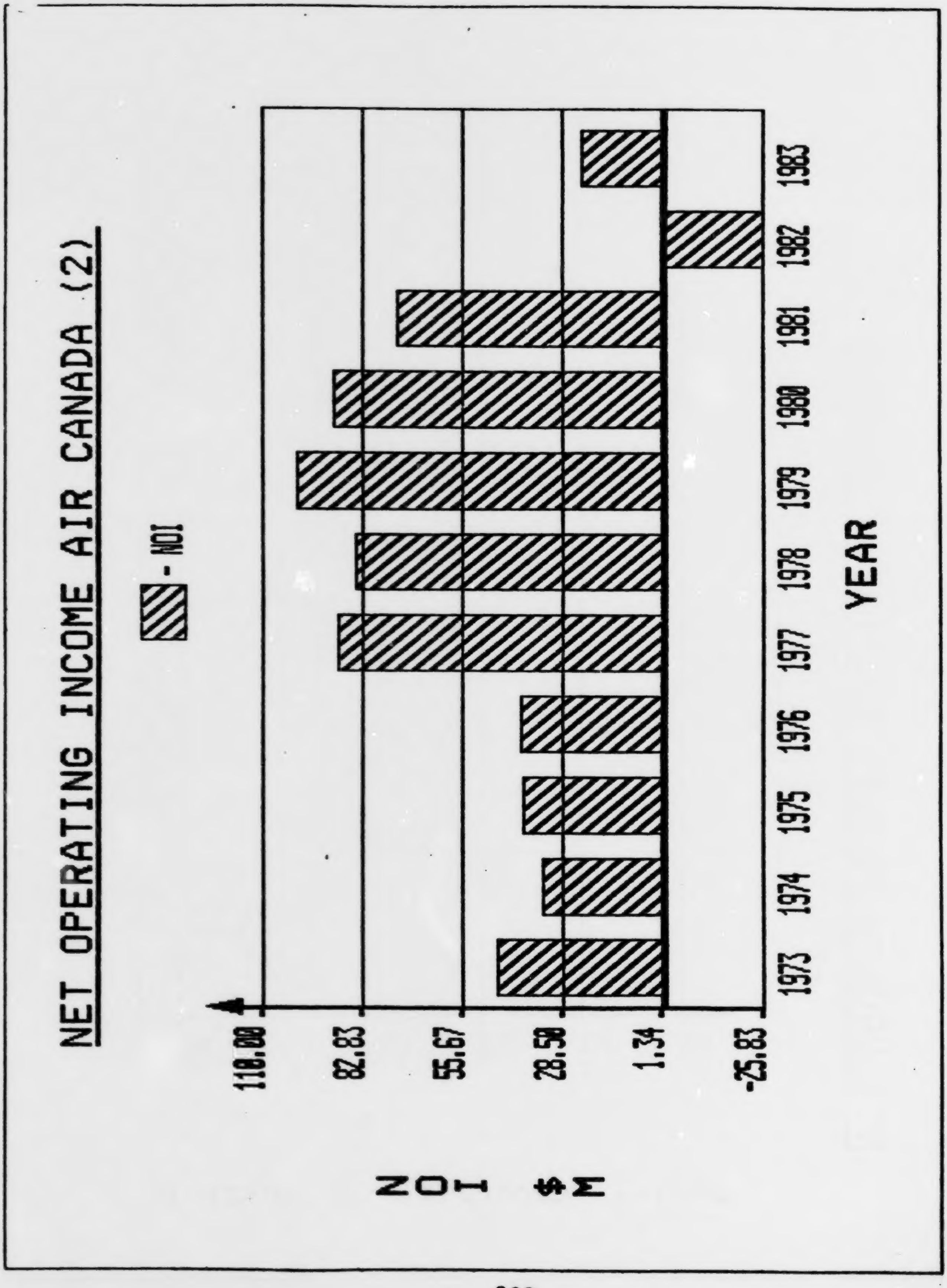
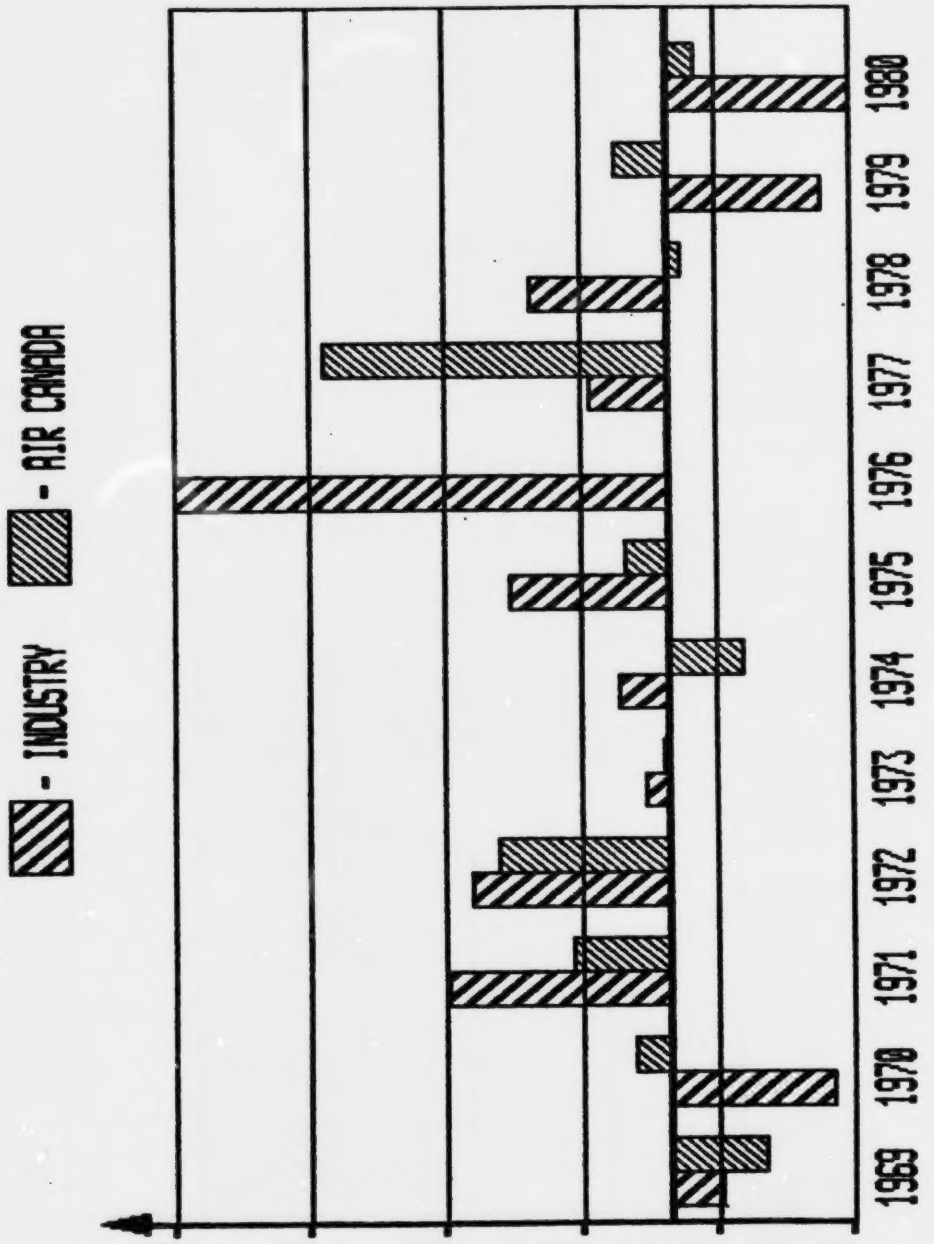

NET OPERATING INCOME AIR CANADA (2)
▨ - NOI
$M NOI
110.00
82.83
55.67
28.50
1.34
-25.83
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
YEAR

EXHIBIT X-8

NOI GROWTH RATES 1969-1980 INDUSTRY & A.C.



rates of Air Canada. The results show that the growth rate is historically 13.5%. The regression coefficient is -.0008, which indicates that there has been virtually no increase or decrease in the rate of change of the growth rate.

In comparison, the growth rate of NOI for the industry is 19.3%, and again the regression coefficient indicates that there is no long term trend. Air Canada growth rates, over the period of the analysis, do not appear to be moving closer or further away from the industry. However, the variability of the Air Canada growth rates is less than that of the average firm in the industry, but both are relatively high.

In addition, the plot of the residuals of the resgressions in Exhibit X-9 for Air Canada, and for the airline industry in Exhibit X-10, suggest that there is no consistent pattern above or below the trend lines. Variation is essentially random from observing the size and number of residuals in relation to the line.

The range of the growth rates is between -.34 and +1.24 for Air Canada, whereas the range for the airline industry over the same period is wider, from -.66 to +1.78. This suggests that Air Canada growth rates have smaller variability than that for the average firm in the industry.

EXHIBIT X-9
AIR CANADA
PLOT OF GROWTH RATE REGRESSION RESIDUALS

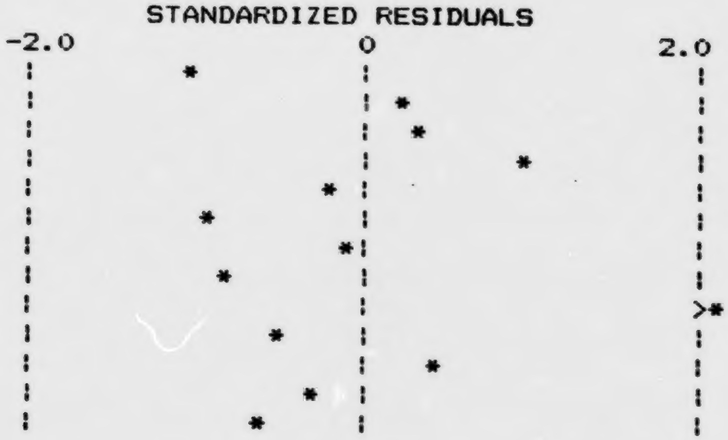
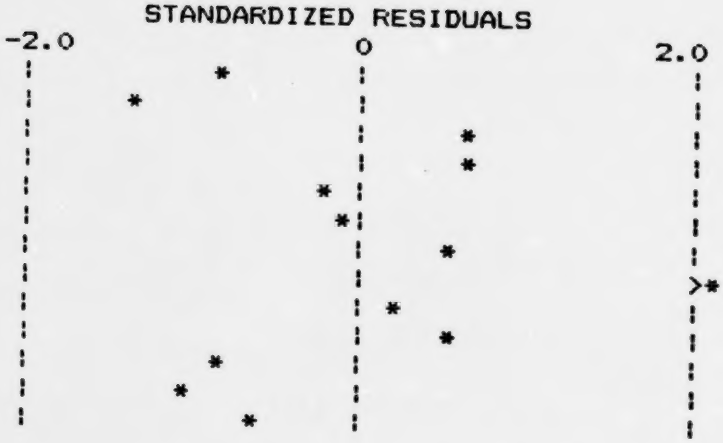


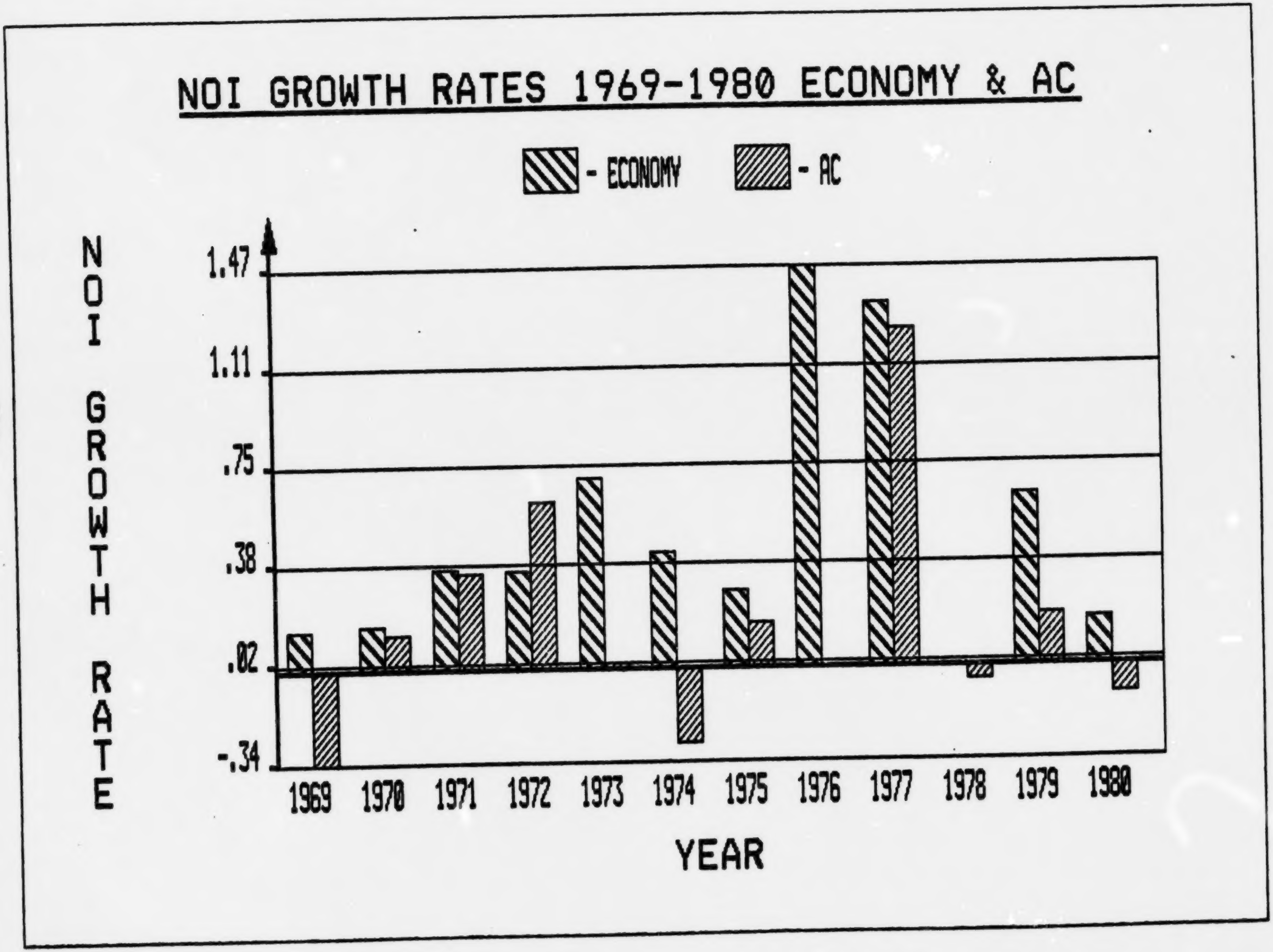
EXHIBIT X-10
AIRLINE INDUSTRY
PLOT OF GROWTH RATE REGRESSION RESIDUALS



While it is possible to extend the industry comparisions to the evaluation of market returns, the primary focus of the investigation is to place the evaluation of Air Canada into the Canadian context. The analyses are directed towards examining the risk and return for equivalent investment in the Canadian economy. Towards these ends, data were obtained on firms which are publicly traded on the Toronto Stock Exchange. This set of firms is necessary in order to calculate equity returns in the later parts of this chapter.

This set of Canadian firms, approximately 250 initially, are used to calculate the net operating income growth rates of the firms in the Canadian economy. These growth rates of NOI are plotted, together with those of Air Canada for comparision, in Exhibit X-11. In most periods, the growth rates of Air Canada are lower than that of the average firm which is privately owned, that is, its shares trade on the stock exchange in Canada. In addition, the standard deviation of the growth rate of Air Canada is approximately twice that of the economy rate.

The importance of measuring the growth rate is to determine the NOI relationship between Air Canada, a non-traded firm, and the Canadian economy, or the traded firms. In order to obtain this relationship, the respective growth rates of Air Canada were



NOI GROWTH RATES 1969-1980 ECONOMY & AC

regressed on the growth rates of the firms in the economy. The statistical relationship which is generated is as follows. The variable ,g, refers to the growth rates.

$$\text{(I)} \quad g_{AC}^{NOI} = .0845 + .1651\ g_{ECONOMY}^{NOI}$$

This functional relationship will be referred to as equation I and will be returned to at a later point in this section of this chapter.

The other income figure which is of central importance in this study, is the net operating income after interest charges, NII. By including interest expenses in the the calculations, the risk of the financial structure on income is incorporated into the evaluations. The NII figures which are calculated from Air Canada's financial data are presented in Exhibits X-12 and X-13 for the 1962-1972 and 1973-1983 periods respectively. The impact of the interest payments are clearly shown, pushing the NII figures to zero, or very close to it in the first graph, and producing negative income in several of the periods of the second graph.

The growth rates of the income stream of Air Canada and for the set of firms whose shares trade in the Canadian markets are

EXHIBIT X-12

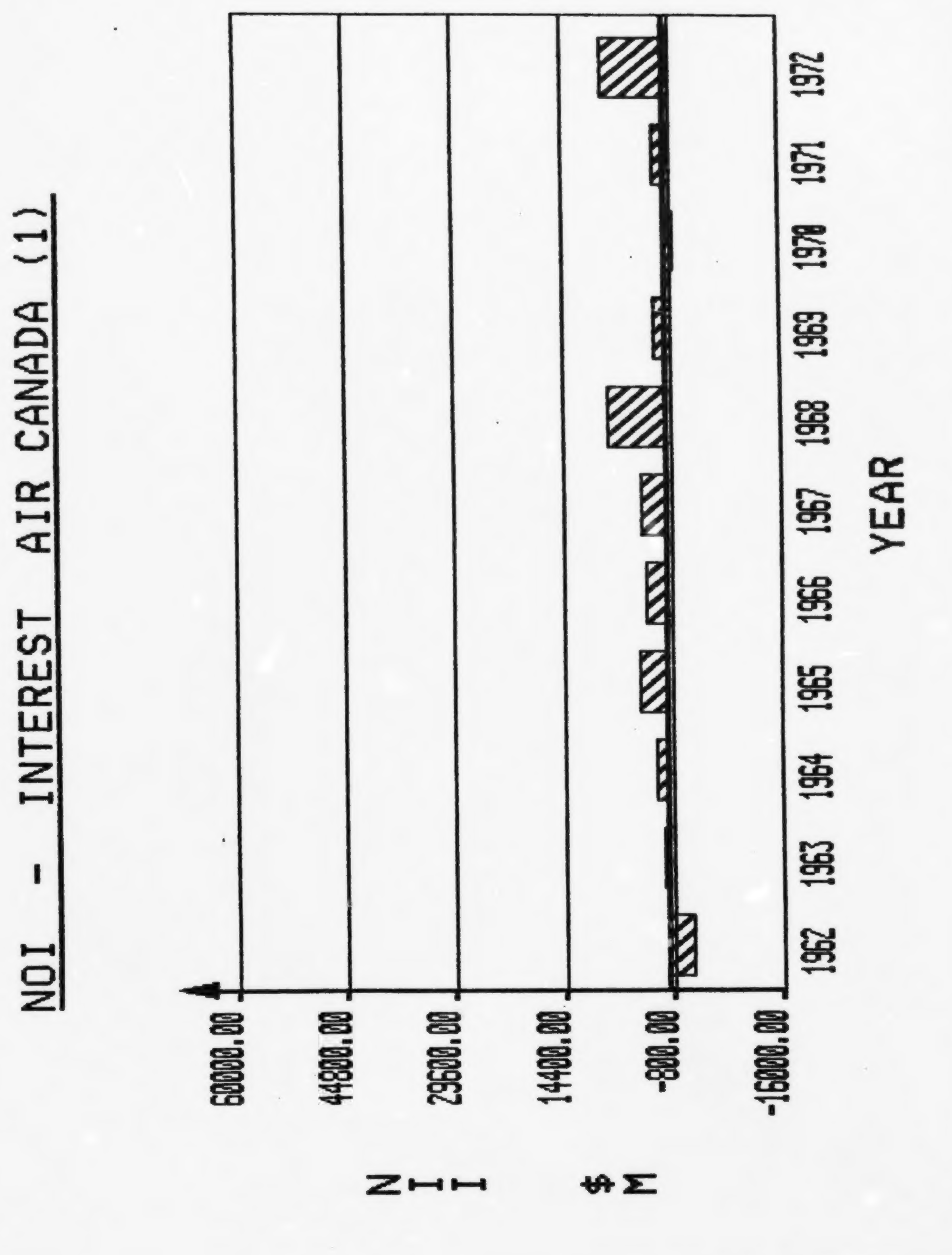
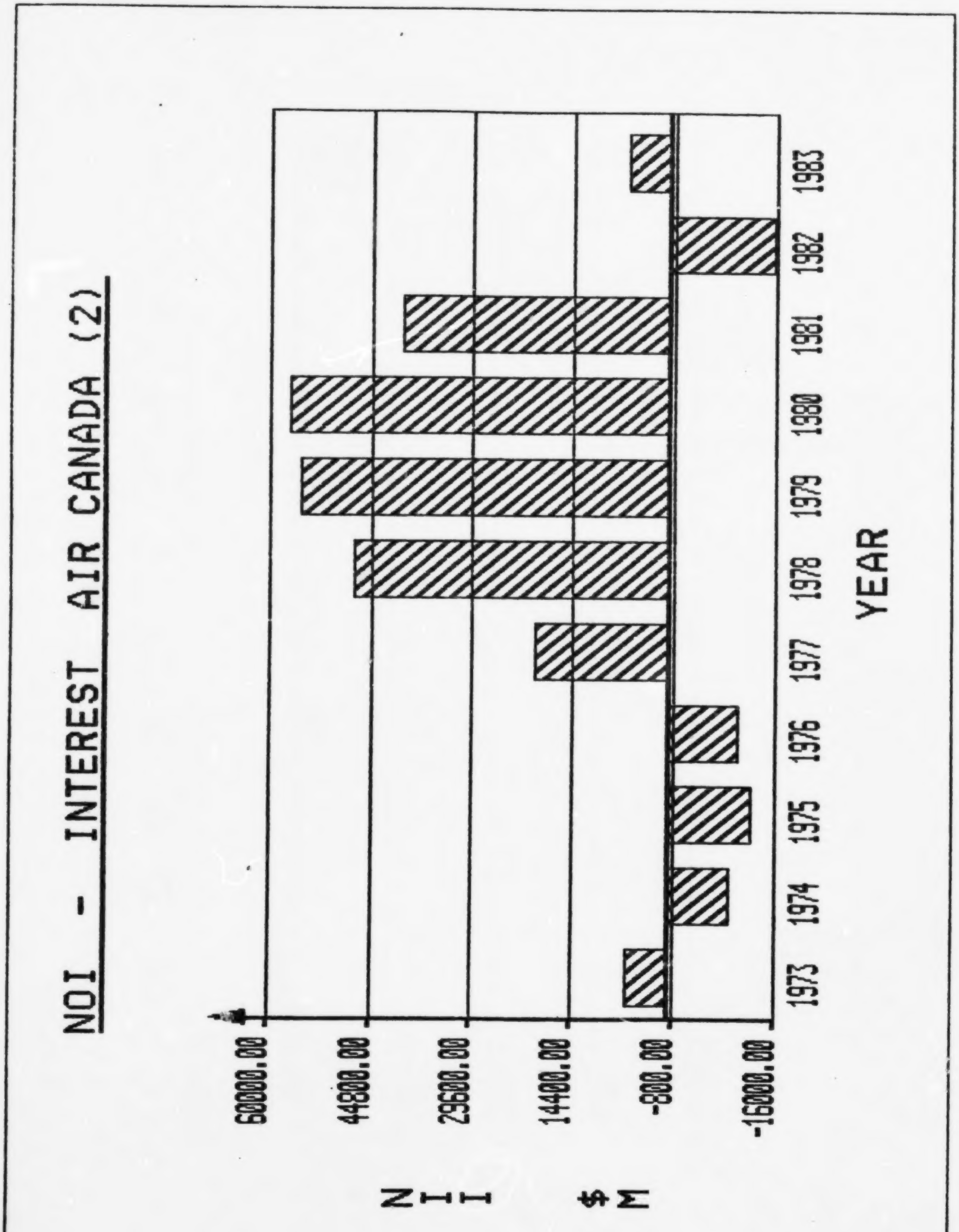

NOI - INTEREST AIR CANADA (1)
60000.00
44800.00
29600.00
14400.00
-800.00
-16000.00
NII $M
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
YEAR

EXHIBIT X-13


NOI - INTEREST AIR CANADA (2)
60000.00
44800.00
29600.00
14400.00
-800.00
-16000.00
NII $M
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
YEAR

computed.. In comparison, Air Canada's average growth rate is approximately the same as for the general economy, but the standard deviation of the growth rates is about five times greater. Air Canada's growth figures suggest the presence of greater risk of return.

In order to examine these relationships further, the Air Canada growth rate figures are correlated with its NII growth rate figures. The same analysis was performed on Canadian National Railways, and also for the economy firms. The correlation matrix appers in Exhibit X-14. The correlation ;for the typical firm in the Canadian economy is +.906 (ENOI X ENII). The Air Canada correlation is +.708 (ACNOI X ACNII) which is lower, suggesting that the interest on debt does not adjust as quickly to changes in the growth of NOI, or operations, as occurs in other Canadian firms. The difference in the correlations is related to the ability to adjust operations, in concert with the necessary adjustments to the financial structure. Interestingly, the correlation of the Canadian National growth rates (CNOI X CNII) is negative, in fact, close to zero which indicates the possibility that there is a substantial gap between the operations and the financing functions in that corporation.

Consistent with the previous NOI analysis, the growth rates

EXHIBIT X-14
GROWTH RATE CORRELATION MATRIX

```
-----------------------------------------------------------------------------
----- CORRELATION MATRIX -----

        YEAR   CNOI    CNII  ACNOI  ACNII   ENOI   ENII
 YEAR  1.000
 CNOI  0.373  1.000
 CNII  0.223 -0.109  1.000
ACNOI -0.008  0.083  0.124  1.000
ACNII  0.011 -0.006  0.182  0.708  1.000
 ENOI -0.091  0.016  0.305  0.089  0.318  1.000
 ENII -0.166 -0.001  0.487  0.278  0.420  0.906  1.000
-----------------------------------------------------------------------------
```

of NII of Air Canada were regressed on the Canadian economy growth rates. The functional relationship which is obtained is referred to as equation II and together with equation I, they appear below.

$$(I) \quad g^{NOI}_{AC} = .0845 + .1651\ g^{NOI}_{ECONOMY}$$

$$(II) \quad g^{NII}_{AC} = -.5142 + 1.9480^{NII}_{ECONOMY}$$

These two functional relationships are also obtained for each of the firms in the Canadian data set which have their equity securities traded on the Canadian equity markets. The critical statistics which are obtained obtained from each pair of functionalrelationships, are the Betas of the regressions, since these are the risk coefficients of these firms, based upon income. The Beta coefficients for each of the firms were presented in Exhibits IX-17 and IX-18 for the NOI and NII growth rate figures respectively. The Beta coefficients are ranked in descending order in each of the exhibits. The coefficents range from +4.9506 to -4.2516 for the NOI results and +4.3514 to -2.3299 for the NII results.

These figures are indicative of the firms in the Canadian economy. They were also used in the case of Canadian National

Railways. The length of the exhibits prohibits reproducing them here, and therefore, reference is made back to those exhibits in the previous chapter, Chapter IX.

C. Portfolio Returns

The NOI and NII Betas of equations I and II in the previous section were matched with the lists of Betas in Exhibits IX-17 and IX-18. Air Canada has a low operating Beta, NOI, and a high financial Beta, NII, as compared to the other firms. This is an unusual characteristic as was indicated previously in the correlation analysis. The two growth rates generally move together and are at approximately the same level.

Ten firms are obtained by applying the matching procedure. The ten firms are formed into a portfolio of firms. The firms are from a variety of industries, indeed, a cross section of the Canadian economy. Their most important characteristics are that their equity securities trade on the financial markets and that their income streams exhibit the same risk/return characteristics as Air Canada.

Each firm in the portfolio has its equity securities traded on the Toronto Stock Exchange. The stock market returns, including dividends, were obtained for each firm in the portfolio. These returns are weighted into overall market returns for this portfolio of firms.

For each of the same periods, the Toronto Stock Market returns are also calculated. Graphs of these returns for the 1962-1972 and the 1973-1983 periods were presented in Chapter IX, Exhibits IX-19 and IX-20. North American stock markets generally move in unison. The correlation between changes in levels of the Canadian and United States markets is approximately +.98. Exhibits X-15 and X-16 show the Standard and Poor's Industrial Index for the the New York Stock Exchange. Although the Canadian figures are used in this study, a United States analysis of market returns will not generate substantially different results.

In addition to the previous data, the dividend yields, that is, dividends divided by market prices of the Toronto Stock Exchange listed firms were also obtained. These dividend yields were presented in Exhibit IX-21. The average yield is approximately 4% for the duration of the exhibit.

The market returns for each period, for each individual firm in the portfolio, are weighted into a single portfolio return of each of the periods. These portfolio returns are regressed on the returns to the entire stock market in order to establish the relationship between the portfolio and the firms which are listed

EXHIBIT X-15

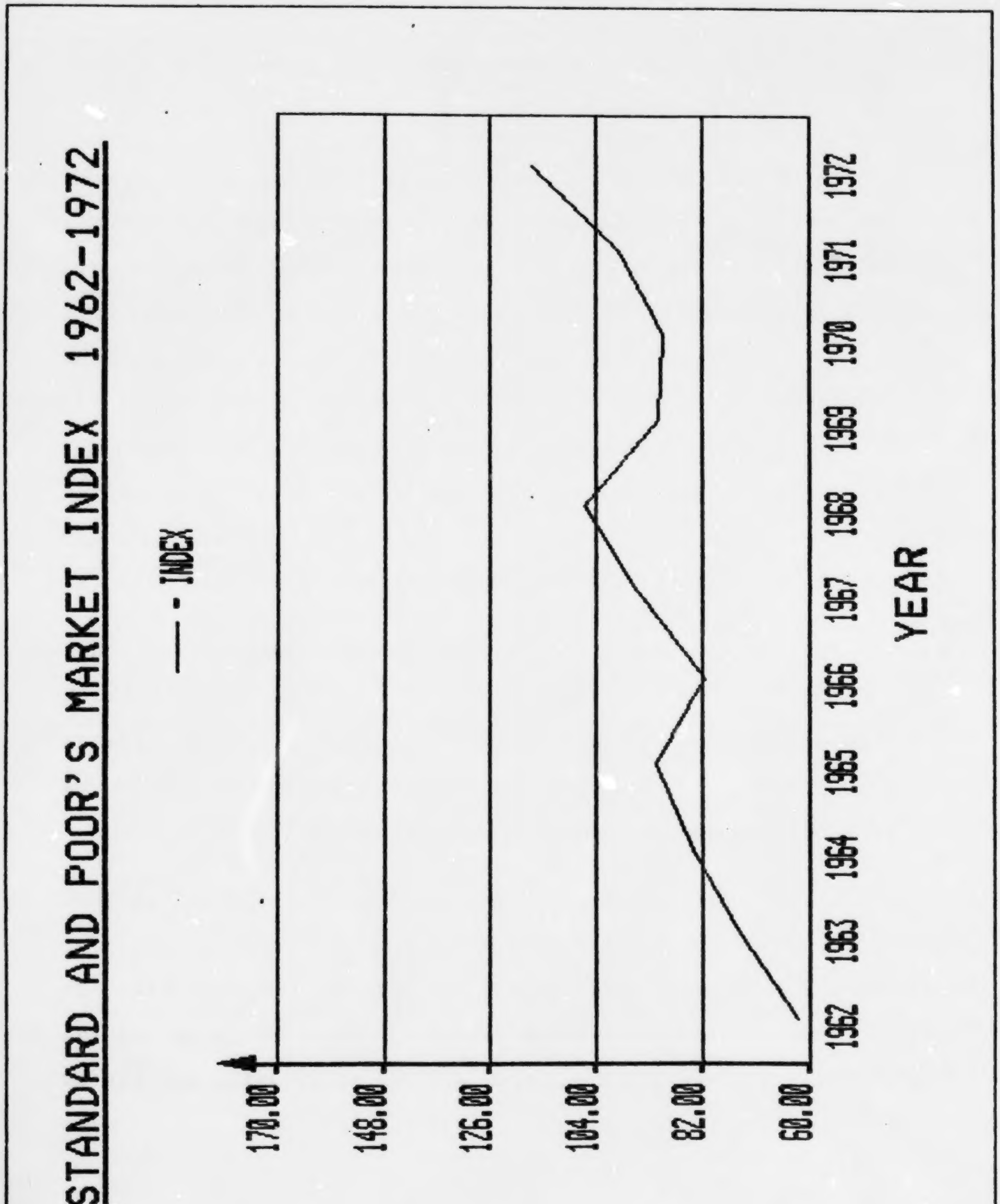
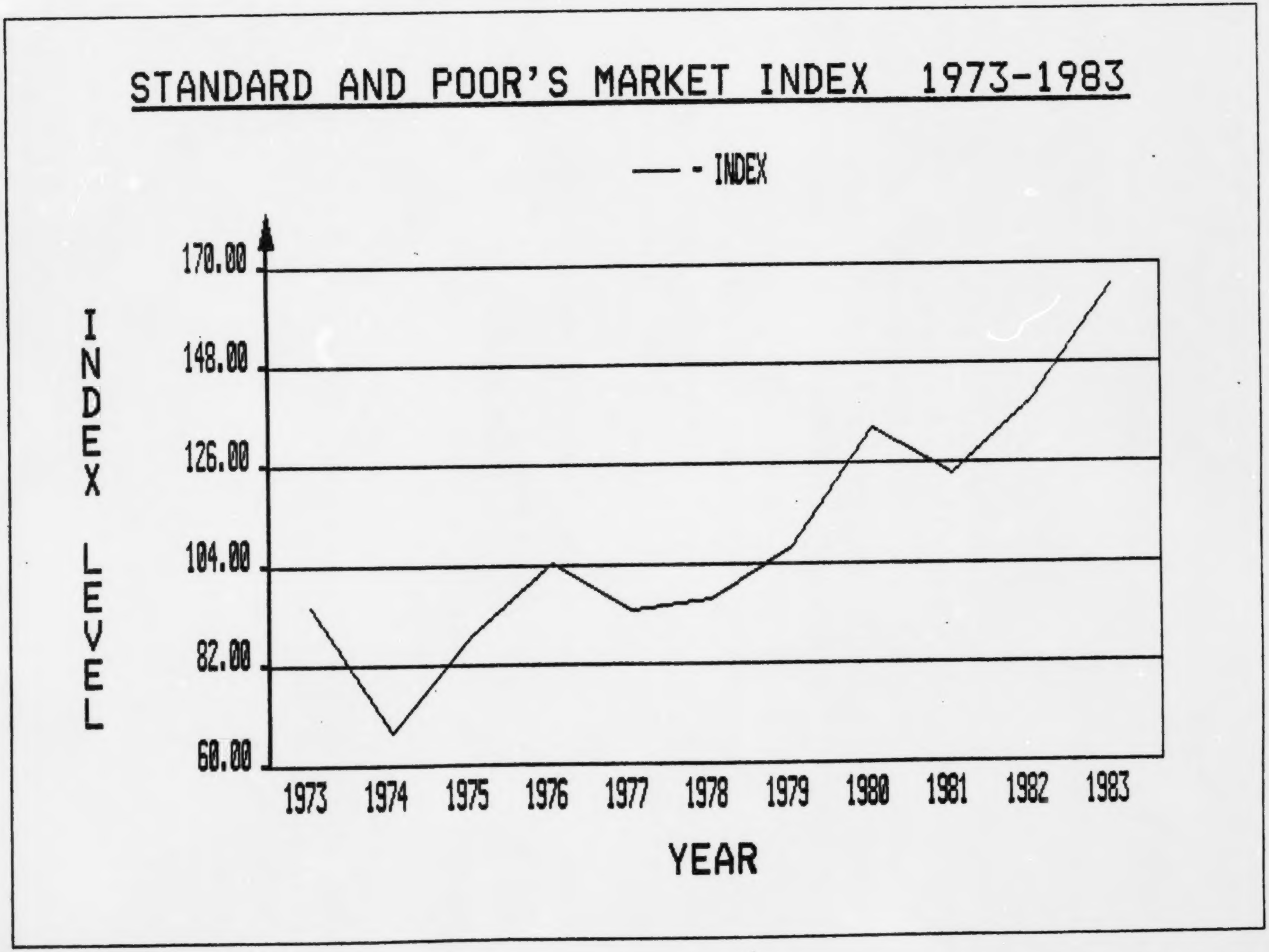

STANDARD AND POOR'S MARKET INDEX 1962-1972
— - INDEX
INDEX LEVEL
170.00
148.00
126.00
104.00
82.00
60.00
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
YEAR

EXHIBIT X-16


STANDARD AND POOR'S MARKET INDEX 1973-1983
- INDEX
INDEX LEVEL
170.00
148.00
126.00
104.00
82.00
60.00
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
YEAR

on the Toronto Stock Exchange. The regression equation which is generated from this statistical procedure is as follows.

$$R_{PORTFOLIO} = -.0249 + 1.4875\ R_{MARKET}$$

$R_{PORTFOLIO}$ is the market return on the portfolio.

R_{MARKET} is the representative return of all stocks on the market for the same period.

The expected Beta for the portfolio, or any well diversified portfolio of firms is +1.0000. The Beta of this portfolio, in the same risk class as Air Canada, is +1.4875, or higher than the market. This suggests that Air Canada is in a higher risk class than the average market traded firm. This is consistent with the income regressions, in which a very high Beta was observed for income. In addition, the coefficent of determination (R^2) is +.9323. Most of the variation of the portfolio returns is explained by the changes in the market returns.

The average returns of the Toronto Stock Market firms is substituted into the portfolio regression equation. The returns to the portfolio are the figures which emerge. The returns to the portfolio are the costs of equity capital, ke, and are found to average 14.67 percent for the period of the analysis.

The regression analysis is performed over a period of time. Therefore, the cost of equity capital is representative of that particular time frame. Other estimates can be obtained by taking longer or short periods for the analysis. In this study, the necessity of determining risk classes from income regressions dictated that a longer time frame be used. For another, traded firm, which has regular returns to its equity on the market, a shorter time frame would be used in order to estimate the market Betas.

The dividend payout ratios of the portfolio firms in the same risk class as Air Canada are calculated. The payout ratio, when applied to the net income which is available to the common shareholders, indicates the amount of dividends which are paid out to shareholders. The average payout ratio for the portfolio is .4231 and the range is from .5273 to .2749. The wide fluctuations means that, from observation of the data, that firms in this risk class regularly adjust their dividends according to changes in income, which increases the risk of the projected dividend stream to shareholders.

The results of the security analysis will be returned to after examining the financial structure and cost of debt of Air Canada.

D. Debt Valuation

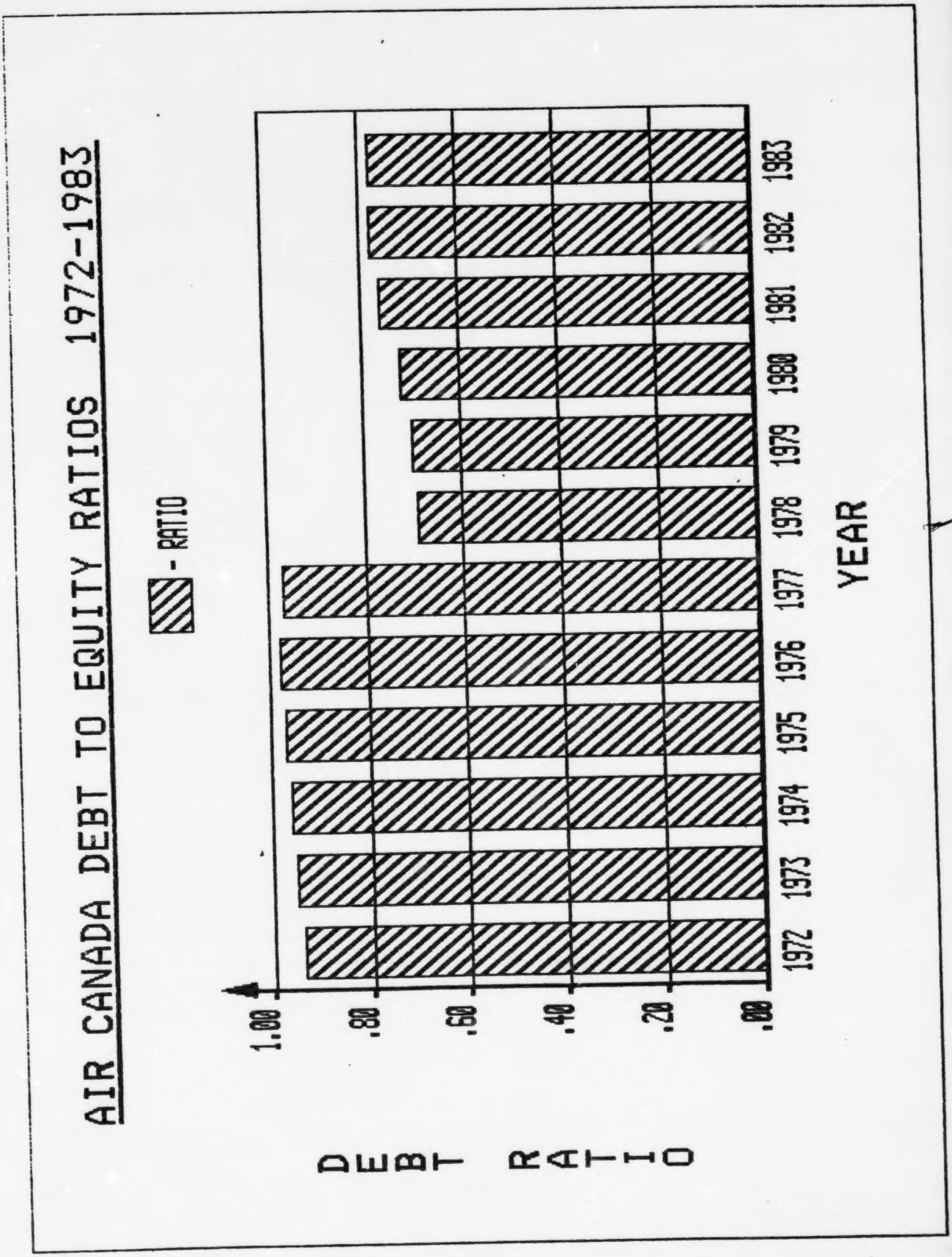
Exhibit X-17 shows the proportions of total debt, current and long term, of the total debt plus equity of Air Canada for the 1972-1983 period. The proportion of total debt in the financial structure decreased from 96 percent in 1977 to 69 percent in 1978, as a result of financial reorganization. By 1983, it has steadily increased to 77 percent.

Market rates of interest have risen substantially in recent years. From the early 1970's to the early 1980's, the market rate of interest approximately doubled, making the cost of debt historically high. The market rates of interest from 1962-1983 have been presented in Exhibits IX-26 and IX-27, in the previous chapter. The market rate of interest for equivalent Air Canada debt was referred to as ki in Chapter VII and VIII.

The book, or coupon rate of interest tends to be lower than the market rates for existing debt when market rates of interest have been rising. As a result, the market value of the existing debt is lower.

Each separate item of long term debt in the financial structure of Air Canada, in each year, is revalued by discounting the payment stream at the market rate of interest. These

EXHIBIT X-17



AIR CANADA DEBT TO EQUITY RATIOS 1972-1983 separate items, for each year, are then added together to yield the value of long term debt of Air Canada. The market value of long term debt is compared to the book value of the debt, as it appeared in the financial records, in Exhibit X-18.

The market value of long term debt was referred to as ,B, in the discussion of theory in Chapters VII and VIII. These values of B, together with the corresponding market rates of interest, ki, are used in the calculation of the Cost of Capital. These market values reflect the current cost of borrowing or replacing the existing debt, and therefore provide information for valuing the financial structure of Air Canada.

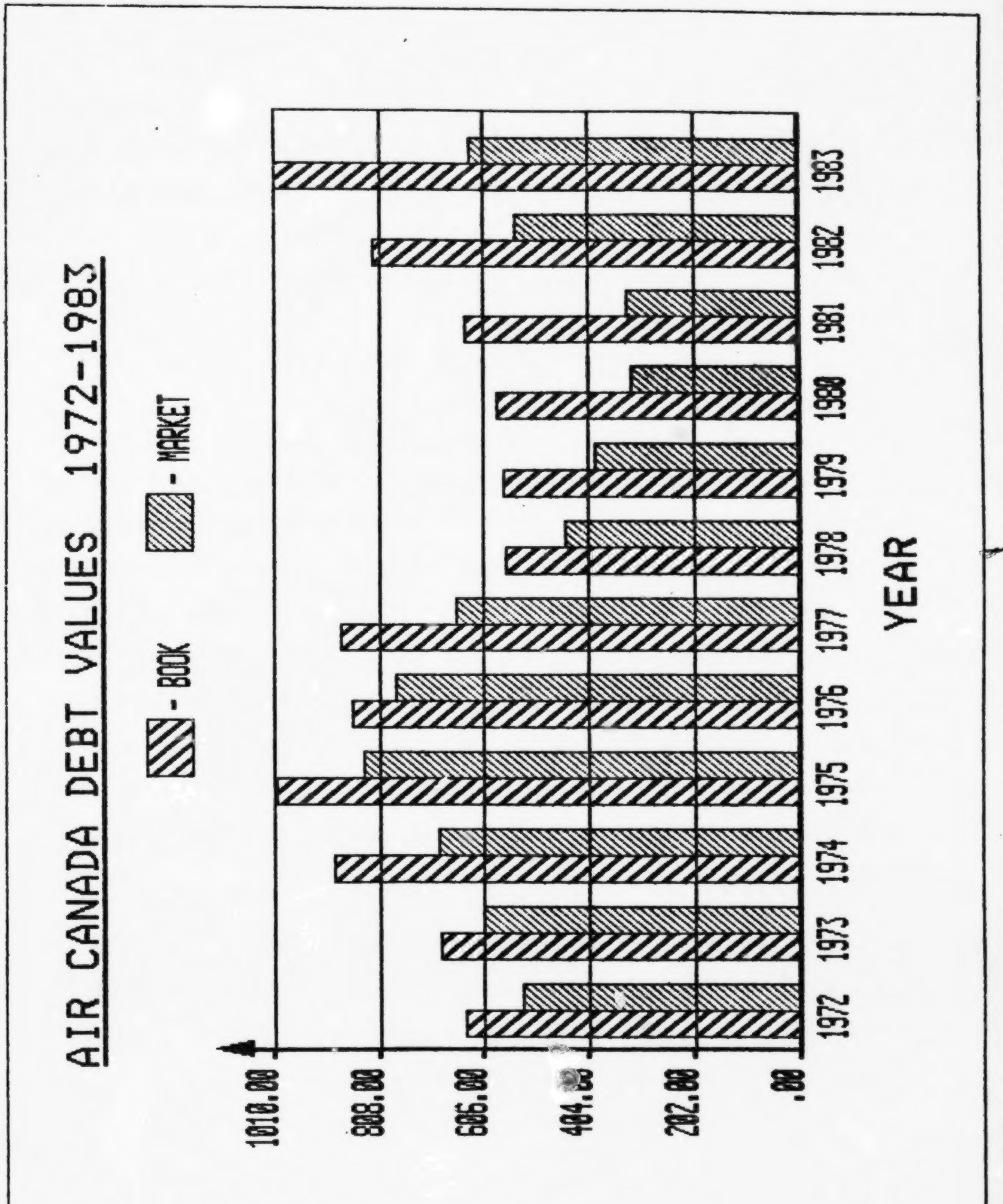
E. Cost of Capital

In section D of this chapter, two of the variables which are necessary for the cost of capital calculations were measured. In section C, the third variable was measured, ke, the cost of equivalent equity capital. These variables are used in the following cost of capital formula.

$$\text{Cost of Capital} = ki \frac{B}{B + E} + ke \frac{E}{B + E}$$

As three of the variables have been measured, the last will be the subject of this section. The final variable is ,E, the

EXHIBIT X-18


AIR CANADA DEBT VALUES 1972-1983
- BOOK
- MARKET
1010.00
808.00
606.00
404.00
202.00
.00
$ MILLIONS
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
YEAR

value of the firm's equity.

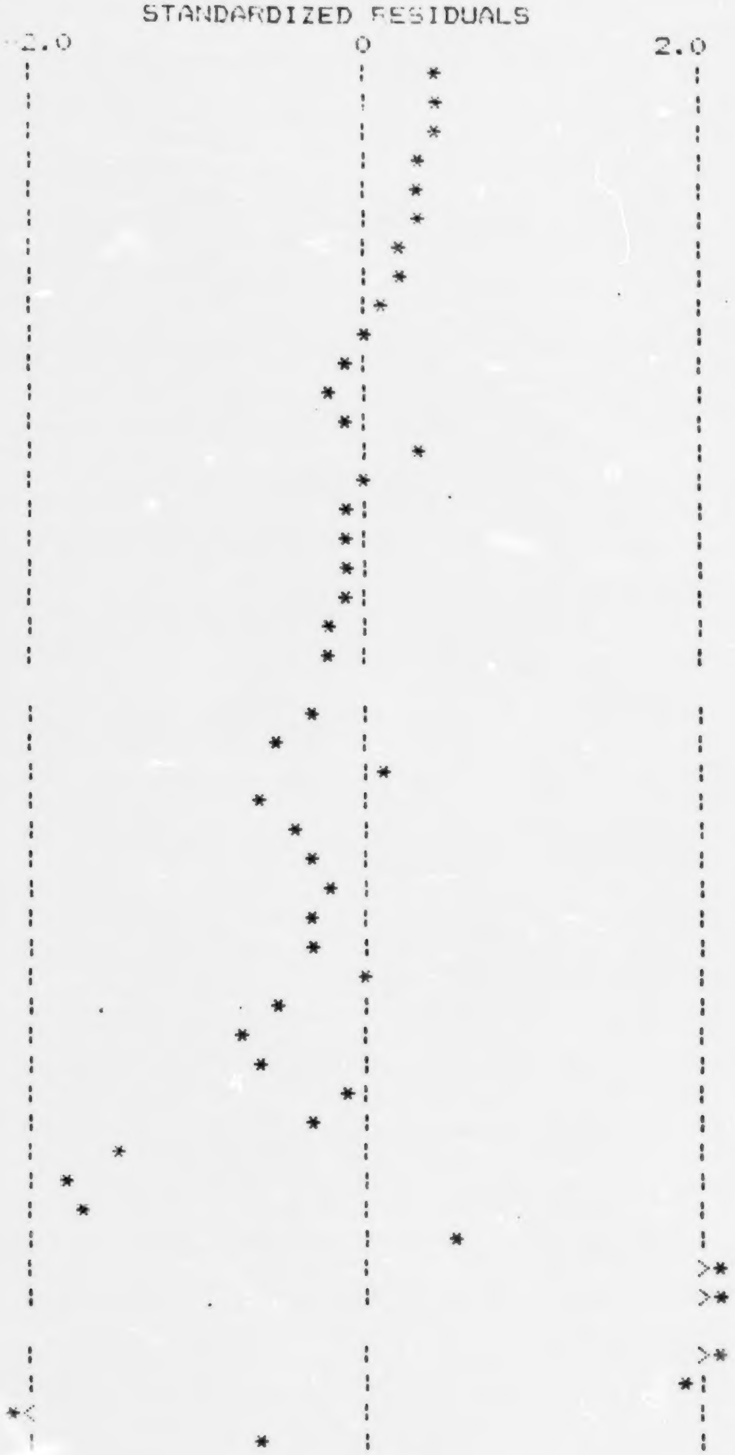
In the normal course of equity valuations, the equity value of a traded firm is established by the trading which occurs in its shares on stock markets, such as the Toronto Stock Exchange. Since Air Canada's shares do not trade on these markets, direct observation of market values is not possible and an indirect approach, consistent with the methods of valuation which were explained in Chapter VII, is used instead.

Market values of securities are derived from evaluations of expected risk and return. The expected or permanent earnings stream is an important element in these evaluations by investors. Earnings of a company can shift dramatically from period to period. These shifts around the long term trend are not as important as changes to the projected level of permanent earnings. Security valuation takes permanent income levels and projects them forward. Consequently, in any time period, the permanent earnings projection is likely to differ from the actual earnings by a random amount.

The validity of exponential time smoothing models or rigorous time fitting of the income stream has not been validated for Air Canada, especially for the period of investigation in this study. While many models of the earnings generation process currently exist in research, and in practice, simple extrapolative models provide reasonable estimates of the permanent income stream. This issue was elaborated in the previous chapter, but an important point bears repeating in the case of Air Canada as well. Difficulties in projecting earnings can exist with all methods of valuation. It is a generic issue of all valuations and not simply because market approaches are being used in this study.

In Exhibit X-19, the regression residuals around the time line of Air Canada's income figures are presented. The projected, 1979 permanent income for example, from the regression is $13.9 million. The actual income is $57.04 million. While the function is correct, the plot of the residuals suggests that the long term pattern has changed, and income estimates from the regression over this long term series are too low. The recent income experience is different from the past. Consequently, while the preference statistically is for a longer income stream, a shorter period is actually used, hopefully increasing the accuracy of the projections and making them more useful. In addition, as in the case of Canadian National in the last chapter, part of the mandate of this study is to explicitly recognize the effects of the Air Canada financial reorganization. The long, historical series improperly weights the significance

EXHIBIT X-19
AIR CANADA
PLOT OF INCOME RESIDUALS



of recent events on the future earnings stream.

The purpose in obtaining the permanent income figures is that the dividends are calculated from them, and then capitalized in order to yield value. Changes in the income stream over time, are accounted for in the capitalization formula by the inclusion of the growth rate of income. Therefore, a base income figure is desired and not the income of any particular year, which is already established, simply by examining the actual results for that year. In addition, the market returns and therefore, the cost of capital which is the final figure, only has meaning for a number of periods, and not any one particular period.

In order to examine the inome figures, the focus of investigation in this analysis is on the recent twelve year period, 1972-1983. The twelve year period is divided into two parts, 1972-1977 before financial reorganization and 1978-1983, after reorganization.

The income base figure which is representative for the period of the analysis is $16.077 million. For the second period, since reorganiation it is considerably higher, $29.375 million and for the prior period, $11.514 million. The base period income figures using averages rather than trend lines are close to these, $15.301, $31.707, and $12.938 respectively. The substantial increase in income in the later part of the 1970's is reflected in the differences in these numbers.

Several time periods and projection models were examined in measuring and estimating the permanent income numbers. The figures which are used are representative of the earnings stream which also reflect the growth rates for the periods included in the analysis. They are not the only estimates which can or were made. Changes in the income estimates, either with added inside information to project the series, or different statistical or analytical models yield different results. However, the main focus of this study is not on earnings projections and as was stated previously, simple extrapolative models in the context of valuations provide if not better, at least adequate initial results. The results are primarily used here for methodological demonstration purposes.

The purpose of the income figures is to supply inputs to the valuation process. In order to provide more information, and establish convergence and therefore, validity, three valuation models are used in this study.

1. The capitalization or growth rate model is the first model which is demonstrated. The rationale for the model was presented in Chapter VII, Section C. Four valuations are produced using

this model; the twelve year period and each of the six year periods. The figure labeled ,Actual, for the 1978-1983 period is derived from an average, rather than a trend model in order to examine the convergence of the methods. The formula for the capitalization model is presented below.

$$E = \frac{NI \ X \ \text{Dividend Payout Ratio}}{ke - g}$$

All of the variables in the formula have been consistently measured for the appropriate period of analysis. The discounted growth rate figures are recalculated from the trend projection analysis.

METHOD	PERIOD	EQUITY VALUE (E) $(000)
Estimated	1972-1983	$193,591
Actual	1978-1983	$339,513
Estimated	1978-1983	$335,145
Estimated	1972-1977	$169,257

2. The second model is the dividend yield model.

$$\text{Dividend Yield} = \frac{\text{Dividends}}{\text{Equity (E)}}$$

$$E = \text{Dividends/Dividend Yield}$$

The income numbers of the respective periods of the analysis are multiplied by the dividend payout ratio of the portfolio of firms in the same risk class as Air Canada. This generates the expected dividends. The dividend yields were also obtained. The equity values are generated by dividing the dividend yield into the expected dividends.

METHOD	PERIOD	EQUITY VALUE (E) ($000)
Estimated	1972-1983	153,453
Actual	1978-1983	310,907
Estimated	1978-1983	280,593
Estimated	1972-1977	1o7,334

Again, both of the 1978-1983 figures are presented for the purpose of comparison.

3. The final model uses price/earnings reltionships. The price earnings ratio relates the price of a share ,P, to the earnings per share of a company ,eps. When both of these variables are multiplied by the number of outstanding shares, the ratio measures equity value.

$$\frac{P}{E} = \text{Price-Earnings Ratio}$$

$$E = \text{NI/ Price-Earnings Ratio}$$

The price earnings ratios of the airline industry are used in this calculation, again for the purposes of analytical convergence. The price/earnings ratios were obtained using the following rules. No negative price/earnings were admitted and any price/earnings ratio greater than twice the industry average were removed. The remaining ratios were averaged. The results which are obtained, upon applying the ratios to Air Canada, appear below.

METHOD	PERIOD	EQUITY (E) ($000)
Estimate	1972-1983	200,319
Actual	1978-1983	395,212
Estimate	1978-1983	366,262
Estimate	1972-1977	143,464

The differences in the results are caused by the different methods and the fact that industry, economy and portfolio figures are used in various parts of the analysis. In spite of these differences in levels and types of variables, the results are not widely different for the same years. The price/earnings model produced the highest valuations but the ratios which are used came from analysis of the airline industry companies, primarily in the United States, which are not regulated. The dividend yield model produced the lowest valuation figures. However, dividends and the dividend yield ratios contain a great deal of variance. The differences in valuations between periods for Air Canada appear due to the higher income levels of the firm during the later 1970's compared to prior periods. The assumption contained in the figures is that the underlying growth rates will be sustained at the same levels.

From the equity values ,E, the cost of capital can be obtained for Air Canada based upon market values of its financial structure. The cost of capital is not particularly sensitive to the differences in valuations between the three models. A high, intermediate, and low figure is obtainable, for each of the periods of the analysis by comparing the results. These three levels should not be construed as statistical extremes nor indicative of the error rates of the valuations. The differences in levels are model differences.

The equity values, E, when combined with the market value of the debt, B, for each period, produce the debt to total equity ratios of Air Canada. These ratios are presented and compared to the ratios which would be obtained using book values in Exhibit X-20.

EXHIBIT X-20
AIR CANADA
DEBT TO TOTAL EQUITY RATIOS

	B/B+E		E/B+E	
E LEVEL	MARKET	BOOK	MARKET	BOOK
1972-1983				
High	.73806	.76883	.26194	.23117
Intermediate	.74461	.76883	.25529	.23117
Low	.78619	.76883	.20381	.23117
1978-1983				
High	.52964	.64539	.47036	.35461
Intermediate	.56725	.64539	.43275	.35461
Low	.58871	.64539	.41129	.35461
1972-1977				
High	.80160	.95412	.19840	.04588
Intermediate	.82659	.95412	.17341	.04588
Low	.87418	.95412	.12582	.04588

Using market values, the debt/equity ratios are all lower than if book values had been used. In addition, the effect of the financial reorganization, and the changes in interest rates are clearly apparent from comparing the periods. At the intermediate level, the debt/equity ratio decreased from 82% to 57% from the early to the later period.

The final step is to combine the debt/equity ratios, from Exhibit X-20, with the market returns which were measured in Section C of this chapter and market rates of interest from section D. The cost of capital of Air Canada for the period of the analysis, using the intermediate valuation, is as follows.

AVERAGE COST OF CAPITAL
AIR CANADA
1972-1983

COST OF CAPITAL = .09575 (.74461) + .1467 (.25536)

COST OF CAPITAL = 10.90%

The analysis is only valid for the time period shown. In order to measure the possible impact of interest rates and market returns, an estimate of the cost of capital was made for the two sub-periods of the analysis. Both market rates of interest and required returns on equity increased substantially during the 1970's and early 1980's. On a short term basis, the cost of capital increased from 8.26% to 13.11% between the two time periods.

It should be noted that several significant events have occured over the period of the analysis. The energy crisis, deregulation in the United States, and reorganization of the company are at the forefront. In addition, the period is characterized by high interest rates, market returns, and inflation. While it is possible to attempt to factor out these complications, it may not be possible to include the future events which will also affect the valuations. The results, therefore, are primarily from an analysis of past results and are not a projection.

Having completed the presentation of the analysis, prior to closing this chapter on Air Canada, several points deserve summarization.

1. The growth of operating income of Air Canada over the period of analysis is below that of the airline industry. The rate of change is fairly stable.
2. The growth of net income is approximately the same as firms in the Canadian economy but the standard deviation is considerably larger.
3. The current market risk class of Air Canada is higher than the average portfolio of firms, thereby requiring a higher than average market return on its equity.

4. Share capital is relatively expensive given the operating and financial risk of the company.

5. The company, using market values, has less long-term debt than the book values would suggest. Approximately 54% compared to 64% in the 1978-1983 period.

6. The correlation between operating and net income is .7 compared to .9 for private enterprise firms. The indication is that Air Canada does not adjust, or cannot adjust, its financing costs as quickly as other Canadian companies.

7. The level of net income is not sufficient to generate market values that approximate or exceed the book values of the company.

8. With the exception of 1982 and 1983, a different earnings growth path has emerged. The path is higher than expected and is questionable whether or not it can be sustained in the current operating and financial environment of the company.

9. The cost of capital, given the economic conditions, the method of analysis, constraints on the data analysis, and assumptions about performance, is found to be 10.9% for the period.

The discussion has followed the main path through the analysis in demonstrating the market valuation approach to measuring the cost of capital. No doubt, refinements are possible and in the discussion, some of these have been indicated. The attempt has been made to follow the theory faithfully, and where inferences had to be made, the rationale has been explained. Because the analysis is concerned with an unnatural event, the investment rates based on market values of non-traded companies, does not suggest that the information which is gained by analysis is artificial. The usage of societies resources and capital is real. While other approaches may result in precise numbers void of inferences, the conviction remains that market values are essential in allocating resources and therefore, it is better to be approximately correct than precisely wrong.

CHAPTER XI

ISSUES IN PRIVATIZATION

XI. ISSUES IN PRIVATIZATION

A. Introduction

The orientation of this study has been heavily influenced by the efficiency of financial markets in allocating capital through the pricing mechanism. For a firm which does not seek equity capital from the markets, the pricing mechanism can only be applied by inferring the effects of expected returns and risks. While surrogate measures of overall performance, such as revenue , expense, capital expenditure control, or a dialectical process such as negotiation of funding or subsidy committments by overseer bodies may substitute for the market mechanism, the criteria used in each of these forms of control and performance evalution must still make reference to the desired level of investment and return. Consequently, alternative methods of control likewise, albeit implicitly, also use an inference process of evaluation. The primary difference in using market measures, is the performance measures are explicitly recognized as part of the evaluation process.

A firm which does not seek equity funds from financial markets can only determine competitive economic returns on capital through comparative analysis. The measurement of optimal internal rates of return become immediately necessarywhen its previously non-traded shares begin to trade on established markets. The level of expected return, commensurate with risk, is established in setting the share price by investors in the market in comparison with the expected return and risk of other investments opportunities. The current and projected operating and finacial results are impounded into the security price and no further inference is necessary as to the level of the cost of capitalwithin the firm to maximize market value, with regards to using market valuations. The allocation of resources is efficently made by the markets, also, removing the need for inferences regarding final performance measures.

The shares of public corporations do not trade on securities markets. Consequently, the analytical process which was applied to Canadian National Railways and Air Canada in the previous two chapters of this report was necessary in order to measure economically efficient rates of return. Part of this process was the determination of market value which is an important factor if the shares were to actually trade on securities markets. But this determination does not imply that the shares of the firm could presently trade or that the firm could immediately approach the equity markets in order to raise capital. .Privatization of a public corporation raises issues that extend beyond the necessity for the valuation of shares and determination of market rates of return.

Whether any particular, group of, or all public corporations will raise equity capital on the securities market is an issue to be settled by the current owner, the Government of Canada. There has been considerable discussion in the Canadian financial press regarding this possibility, especially with regards to Air Canada. It is clear that the government is moving cautiously on this issue and the ultimate decision being primarily political, may take a considerable period of time, and not satisfy all parties involved. There are sound economic reasons, from the point of view of the ability to raise capital and efficiently allocate resources within the economy, which encourage privatization. In Canada, public corporations account for a considerably larger proprotion of the economic activity compared to, for example, the United States. Many critiques would regard this as too high and encourage privatization.

It should be pointed out that privatization does not imply deregulation. Many sectors of the economy are regulated, even though they are private, in various ways, such as the rates which they can charge or the subsidies which they need. Deregulation is a separate issue which deserves its own careful analysis and is beyond the scope of this study. Similarly, the decision model for deciding whether a public corporation should be privatized constitutes a separate study which cannot be given the needed level of investigation within the scope of this study.

The focus of this study has been on public enterprise finance. In order to investigate this activity, the methodology has required that public enterprise corporations be compared to their counterparts in private industry which seek equity capital on the securities markets. In this process of investigation, the possibility of privatization was at the forefront. A group of important issues were uncovered which affect the practical process of privatization of public enterprises. These issues are the subject of the following section.

B. Privatization Issues

1. The equity form of ownership has been historically recognized as an important vehicle for the concentration and accumulation of capital, the attainment of returns to scale, and the diversification of ownership. From the early beginnings of the corporate structure of business, the relationship between management and the shareholders of the corporation have been safeguarded. The requirements on the management of any

corporation are contained in company law. The sale of equity securities by a public corporation would make it subject to the rights of its shareholders. Shareholders have rights to internal information on operating and financial affairs of the corporation. Even if the public corporation is only partially sold on the market, all information becomes subject to shareholder scrutiny. At present, and no fault is suggested, only information which is deemed appropriate to be released is reported. Privatization of public corporations would cause a change in the relationship of the corporation to the government and to its new shareholders.

2. The current process of appointing directors and chief operating officers of public corporations, such as Air Canada and Canadian National Railways would also be changed by privatization. In private corporations, the board of directors is elected by ballot by the shareholders. Provision must be made for an annual meeting of the shareholders, whereby any shareholder may legally seek information and receive the right to vote for representation.

3. The present financial reporting practices will also require changes. The issuance of new shares requires a prospectus, outlining the planned capital expansion, reasons for the capital

requirements, and the projected financial results, among other information. Public corporations currently do not follow this procedure in acquiring capital.

4. Privatization of a public corporation would mean that the financial statements will have to be prepared using Generally Accepted Accounting Practices in Canada. In addition, if shares are sold in the United States, the Securities and Exchange Commission requirements will have to be met. At present, some of the reporting practices used by public corporations may require changes. The current purpose of financial reports of public corporations is to report to the government and these reports tend to emphasize the separation of various parts of the business, their profitability or unprofitability. For example, Canadian National Railways has deferred writing off certain types of losses to future years, adjustments have been made directly to retained earnings, interest charges have been allocated to divisions, and some subsidies are recorded on the cash, not accrual basis of accounting. These practices are acceptable for a public corporation but under privatization, would be questionable.

5. These financial charges would primarily be determined by an regular, independent audit of the financial results in a private

corporation. Financial statements of public corporations are currently audited. But in a private corporation, the auditing firm is elected by the shareholders, not by the government. Further, the objective of the audit is to report directly to the shareholders and not any other political or special group.

6. Currently, the government is not only a major supplier of capital to public corporations, but is also a major customer. The present arrangement is complex in that the government is also the owner. Privatization necessitates that these roles be separated. In particular, the government under privatization would become another customer for which the services rendered would have to become negotiated and contracted at fair market prices in order to earn the required rates of return.

7. Contractual obligations for service (as in a private company venture), would also mean that much of the uncertainty about government support of public enterprises would be eliminated. In the past, uncertainty about government subsidies has led to delayed recognition of receivables, and consequently, revenues to the accounts of public corporations. Under a privatization arranagement, these services would be billable under contract with appropriate charges for late payments. It is only under an "arms length" approach that fair valuations under

privatization can occur.

8. Both Air Canada and Canadian National currently utilize the bond markets for sources of investment funds. Being public corporations, they do not currently access the equity markets. Implicitly, public corporations have considerably more financial backing, namely the financial resources of the Government of Canada. They enjoy quality bond ratings with the appropriate rates of interest on debt. However, privatization would mean that debtors (bond holders) would have to depend upon the financial strength of the public corporation alone, and not the resources of the Government since shareholders would have limited liability. Under privatization, the bond ratings could be revised. Given the past financial performance, this may mean that the cost of debt to the public corporation would rise. Removing the financial umbrella of the Government may realistically mean that higher financial costs would be incurred which probably would require higher rates for services than currently exist. In an era in which competition is forcing especially transportation rates down, the operational profitability of the public corporations could be seriously questioned.

9. The size of the interest payments compared to the operating

income has been large in public corporations in the past. The result has been continuing losses in net income, although in some years, they have shown a profit. Public corporations have been relatively (compared to private corporations) isolated in the consequences. While cost-cutting has occured, serious and continuing losses by a private corporation, would typically result in more severe measures such as a change in management, reoranization, sale of part of the firm, or ultimately bankruptcy. The past performance of public corporations, and the shelter which they are under, raises questions about whether the personnel, management, systems, and organization are currently prepared to undertake the pressures and consequences of privatization.

10. Remittances to the Government of Canada by public corporations are taken from income, for example 20%. If there is no income, then there is no payment. Privatization however, necessitates a dividend policy which remains essentially stable in good years and bad. Severely changing the dividend rate affects the share price. Dividends are part of the return, in addition to share value appreciation, expected by shareholders. The contemplation of privatization would mean that a dividend policy, not just dividends be established.

C. Canadian National Railways and Air Canada

A consternation regarding the issue of privatization which comes to the forefront in analyzing Canadian National Railways and Air Canada, is the reason for privatization. The impression is that an important impetus to privatization, by proponents, is the ability to raise new sources of funds from currently unavailable markets for expansion, investment, and maintenance of the operating structure. Raising funds through bond markets means that interest must be paid, and regularly. In addition, high interest rates in recent years, have made long term debt financing relatively unattractive. There are many other financing options which are open to private firms which are not currently available to private corporations. Indeed, a modern characteristic of financial markets is the diversity of various types of securities which have appeared, which carry some of the characteristics of debt and some of equity, including various forms of options. The financial community has opened new markets in recent years for these financial instruments. The availability of these sources requires that the corporation has equity securities. Consequently, there are additional financing opportunities by having established an equity base in a company.

Being able to match operating needs with financial sources has an important effect on the level and variability of the earnings stream. Privatization would mean that the "bottom line" has to be managed. Absence of overall management of the operating, and the financial structures, creates increased risk of the earnings and dividends stream, and therefore affects the company's security values. Raising new capital can be costly under these conditions.

The financing costs of long term debt are apparent. They must be paid regularly and appear in the financial statements as interest expense. As the numbers are clear, their cost is evident. In contrast, the only part of equity costs which appear in financial reports are for dividends, if any. The cost of equity, however, even though it must be estimated is not zero, and, in fact, can be substantially higher than the cost of debt. If privatization is regarded as a costless or cheap form of raising capital, then there are serious doubts about the reason for privatization.

The analyses of Canadian National Railways and Air Canada in the previous chapters have used their operating and financial structures as they currently exist. Privatization would, or would be expected, to change the financial characteristics of the company, particularly its financial structure and its sources and uses of funds. Therefore, the prospect of privatization requires incorporating the planned changes into the analysis which would, in all likelihood, change the levels of the variables in market valuations. The distinction is important in that valuation as if a firm is private is different than if it is becoming private.

The selling price of new shares, is greatly influenced by the amount for which they can be expected to be sold. Equity markets establish per share, and total valuations immediately upon trading in a company's shares. The only true valuation of Canadian National Railways, Air Canada, or any other companies is the level at which the shares actually sold. At that point, expected valuations become unnecessry.

D. Market Valuation Approach

It is appropriate at the completion of this study, to reinforce the approach which has been demostrated. Markets allocate resources efficently in society. Financial resources are allocated by markets through the price mechanism. Dollars flow to investments with higher returns and away from investments with lower returns. In this manner, the preferences of society are manifested. Minor imperfections, or difficulties with measurement, do not justify ignoring the financial resource allocation system in Canadian society.

Performance measurement is always made against a standard or expected performance measure. For some public corporations, perhaps the only way to judge operating performance is against the objectives which have been laid out for those ventures. Operating characteristics have not been explored, nor is this an issue in this study. Where internal weaknesses or constraints on management of public enterprise exist is not within the scope of investigation. No matter what level of income, efficent or inefficent, or financial structure, optimal or not optimal, the financial markets will set a level of risk and return, given those strengths or weaknesses. The market valuation approach examines the level which the market sets, or would set. By knowing this information, the corporation is then able to improve its performance.

In chapters one to six, the allocation process of the financial markets was preesnted. Chapter seven described financial valuation techniques and these were extended to the case of non-traded, public, or crown corporations in chapter eight. This methodology was applied to Canadian National Railways in chapter nine and Air Canada in chapter ten. This last chapter has looked at privatization. In another context, each of these parts could have constituted a separate study in itself. Certainly, it is recognized that the market valuations of two major non-traded firms, Canadian National Railways and Air Canada, is a major undertaking. The breadth of this report has dictated that in the presentation, many of the details, have had to be relegated to the background in favour of emphasizing the main line of argumentation. In spite of this limitation, the intention remains a desirable one, which is to provoke new avenues of thought and investigation which will lead to better financial management of public enterprises.

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